STORMWATER MANAGEMENT REPORT

FOR

ROLESVILLE ROAD MIXED USE

ROLESVILLE, NORTH CAROLINA

JULY 31, 2025



PREPARED BY:

FLM Engineering, Inc. PO Box 91727 Raleigh, NC 27675 919.423.8975 Firm NC License No. C-4222



Table of Contents

1.0	Introduction	1
2.0	Existing Site	1
3.0	Proposed Development	1
4.0	Stormwater Management Summary	1
4.1	Design Data and Methodologies	2
4.2	Pre-development Analysis	2
4.3	Post-development Analysis	2
4.4	Operations and Maintenance	3
4.5	Nutrient Loading Results	3
5.0	Downstream Impact Analysis	3
6.0	Erosion & Sediment Control Summary	4
7.0	Limitations	4

Tables

Table 5-1 Pre- and Post-Development Summary

Appendices

Appendix A FEMA Map

Appendix B USACE Determinations

Appendix C NRCS Soils Report

Appendix D Rainfall Depths

Appendix E Pre-development Watershed Map

Appendix F Post-development Watershed Map

Appendix G Wake County Stormwater Municipal Tool

Appendix H Post-development Hydrologic Model

Appendix I Water Quality Calculations

Appendix J Operation and Maintenance Documents

Appendix K Downstream Impact Analysis

Appendix L Rip Rap Outlet Protection Design

Appendix M Skimmer Dewatering Calculations

1.0 Introduction

Rolesville Road Mixed Use is a proposed 68-unit townhome development on approximately 12 acres on Rolesville Road (Wake County Parcel ID No. 1768-33-7689) in Rolesville, North Carolina. This report describes how the project complies with the Wake County Stormwater Ordinance. The following sections include descriptions of the existing site, the proposed development, and the stormwater management summary for the project.

2.0 Existing Site

The approximately 12-acre parcel is an existing wooded parcel. The property is located within the Harris Creek watershed of the Neuse River basin. Based on a review Federal Emergency Management Agency (FEMA) map number 3720176800K, dated July 19, 2022, no portion of the parcel lies within a FEMA designated 100-year floodplain. The FEMA map is included in Appendix A. The property was investigated by Pilot Environmental for the presence of jurisdictional wetlands and streams, and no features are present onsite as evidenced by the United States Army Corps of Engineers (USACE) jurisdictional determination in Appendix B.

The site generally drains from east to west with topography ranging from approximately elevation 397' to elevation 386'. Soils on the site are Hydrologic Soil Groups (HSGs) B, C and D as shown in the Natural Resources Conservation Service (NRCS) soil report in Appendix C.

3.0 Proposed Development

The proposed development will consist of 68 townhome units with associated roads, sidewalks, and other improvements totaling 171,603 square feet (3.94 acres) of impervious surface. An additional 41,417 square feet of impervious area associated with the future commercial outparcel was accounted for in the stormwater management design.

4.0 Stormwater Management Summary

The stormwater management summary describes the design data and methodologies, the preand post-development analyses and summary and the nutrient loading results.

4.1 Design Data and Methodologies

The design of the proposed stormwater management facilities was performed in accordance with Wake County requirements and following the North Carolina Department of Environmental Quality (NCDEQ) Stormwater Design Manual. The Neuse River watershed standards require that nitrogen loading contributed by the proposed new development shall not exceed 3.6 pounds per acre per year. Wake County stipulates that the proposed development shall not result in a net increase in peak flow leaving the site from pre-development conditions for the one-year, 24-hour storm event.

The Wake County Stormwater Hybrid Tool spreadsheet was used to calculate nutrient loading and target curve numbers. HydroCAD Version 8.50, a computer modeling software package, was used for the analysis of stormwater routing and hydrology of the existing and proposed watersheds. The hydrology calculations were performed using the Natural Resources Conservation Service (NRCS) Soil Conservation Service (SCS) Technical Release 55 (TR-55) methodology. Wake County lies within the Type II rainfall distribution. The rainfall amounts for the site were obtained from the National Oceanic and Atmospheric Administration (NOAA) and are included in Appendix D.

4.2 Pre-development Analysis

The pre-development watersheds were approximated based on recent aerial photography and Wake County topographic data. The peak flow rate for the one-year, 24-hour storm event is based on the land use cover (such as open space, grass, woods, etc.) and soil type. Refer to Appendix E for the pre-development watershed map.

4.3 Post-development Analysis

An analysis of the post-development runoff was performed using the same methods, parameters, and assumptions as described in the pre-development analysis above. Based upon the calculations, the project does not create an increase in the peak runoff rate for the one-year, 24-hour storm event.

To capture runoff volume and to reduce the nutrient loading and the post-development peak rate of runoff, one wetland is proposed. The proposed wetland provides the required volume, peak rate attenuation, and nutrient reduction for the project. The post-development watershed map is included in Appendix F.

The Wake County Stormwater Municipal Tool calculates the pre- and post-development peak rates of runoff for the 1-year, 24-hour storm events and is included in Appendix G. The post-development with controls hydrologic model for the 1-year, 24-hour storm event is included in Appendix H.

The proposed wetland has been designed in accordance with the North Carolina Stormwater Design Manual. The wetland was sized using the simple method, and the water quality volume will draw down between two and five days as shown in Appendix I.

4.4 Operations and Maintenance

An Operations and Maintenance Agreement to ensure that the stormwater wetland operates as designed has been prepared for this site. Refer to Appendix J for the agreement.

4.5 Nutrient Loading Results

The Stormwater Tool in Appendix H shows that the post-development nitrogen loading will be 4.98 lb/ac/yr.

5.0 Downstream Impact Analysis

In accordance with Wake County UDO Section, 9-22-1, a Downstream Impact Analysis was performed to determine if the project will cause any unintentional additional impacts on flooding or channel degradation downstream of the project site.

The analysis was performed using the "10% rule" drainage area evaluation for the 10-year, 24-hour storm event per Wake County's *Downstream Impact Analysis* – the 10% Rule guidance document. USGS StreamStats was used to evaluate the drainage area. The StreamStats report is included in Appendix K. As shown in the StreamStats report, the drainage area is 0.27 square

mile, or 172.8 acres. The project site is 11.78 acres, or about seven percent of the total drainage area, which is equal to or less than 10 percent of the total drainage area. The StreamStats report was used to model the pre- and post-development drainage areas in HydroCAD, and the pre- and post-development hydrologic model results are included in Appendix K. As shown in the hydrologic models, this project reduces the peak flow rate in the post-development to less than that in the pre-development condition.

Table 5-1

Pre- and Post-Development Summary

Storm Event (24-hour)	Pre-development Peak Flow (CFS)	Post-development Peak Flow (CFS)	Difference
10-year	359.67	356.67	-0.8%

6.0 Erosion & Sediment Control Summary

Erosion and sediment control measures are provided for the installation of the proposed infrastructure and generally include one skimmer basin, two temporary diversions, and silt fence. The skimmer basin will be converted to the wetland after the site is stabilized. Erosion control calculations are provided on site construction plan sheet C-4. Calculations for the energy dissipators are included in Appendix L of this report. The worst-case drainage area to the skimmer basin is the post-development drainage area, which is shown on the map in Appendix F. The skimmer dewatering calculations are included in Appendix M.

7.0 Limitations

This work was performed in a manner consistent with the level of care and skill ordinarily exercised by other members of FLM Engineering's (FLM) profession practicing in the same locality, and under similar conditions, as of the date any services were provided. FLM's opinions and recommendations were necessarily based on a limited number of data and observations. It is possible that actual conditions could vary beyond the data evaluated. Therefore, FLM makes no guarantee or warranty, express or implied, regarding any services, communications, reports, opinions, or instruments of service provided.

APPENDIX A FEMA MAP



cooperative partnership between the State of North Carolina and the Federal Emergency Management Agency (FEMA). The State of North Carolina has implemented a long term approach to floodplain management to decrease the costs associated with flooding. This is demonstrated by the State's commitment to map flood hazard areas at the local level. As a part of this effort, the State of North Carolina has joined in a Cooperating Technical State agreement with FEMA to produce and maintain this digital FIRM.

FLOOD HAZARD INFORMATION

SPECIAL FLOOD

HAZARD AREAS

FEATURES

SEE FIS REPORT FOR ZONE DESCRIPTIONS AND INDEX MAP **FOR FIRM PANEL LAYOUT**

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING **DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT** HTTPS://FRIS.NC.GOV/FRIS HTTPS://MSC.FEMA.GOV

Regulatory Floodway

Without Base Flood Elevation (BFE) Zone A,V, A99

With BFE or Depth Zone AE, AO, AH, VE, AR

0.2% Annual Chance Flood Hazard, Areas of 1% Annual Chance Flood with Average **Depth Less Than One Foot or With Drainage** Areas of Less Than One Square Mile Zone X Future Conditions 1% Annual **Chance Flood Hazard** *Zone X* OTHER AREAS OF Area with Reduced Flood Risk due to Levee FLOOD HAZARD **See Notes** Zone X OTHER Areas Determined to be Outside the AREAS **0.2% Annual Chance Floodplain** *Zone X* ----- Channel, Culvert, or Storm Sewer **GENERAL** Levee, Dike, or Floodwall **STRUCTURES (012) 18.2 Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)** (8) - - - - Coastal Transect — - - Coastal Transect Baseline **Profile Baseline Hydrographic Feature Limit of Study OTHER**

Jurisdiction Boundary

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at https://msc.fema.gov. An accompanying Flood Insurance Study report, Letter of Map Revision (LOMR) or Letter of Map Amendment (LOMA) revising portions of this panel, and digital versions of this FIRM may be available. Visit the North Carolina Floodplain Mapping Program website at https://flood.nc.gov/ncflood, or contact the FEMA Map Service Center.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in the community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Flood Insurance Study (FIS) means an examination, evaluation, and determination of flood hazards, corresponding water surface elevations, flood hazard risk zones, and other flood data in a community issued by the North Carolina Floodplain Mapping Program (NCFMP). The Flood Insurance Study (FIS) is comprised of the following products used together: the Digital Flood Hazard Database, the Water Surface Elevation Rasters, the digitally derived, autogenerated Flood Insurance Rate Map and the Flood Insurance Survey Report. A Flood Insurance Survey is a compilation and presentation of flood risk data for specific watercourses, lakes, and coastal flood hazard areas within a community. This report contains detailed flood elevation data, data tables and FIRM indices. When a flood study is completed for the NFIP, the digital information, reports and maps are assembled into an FIS. Information shown on this FIRM is provided in digital format by the NCFMP. Base map information shown on this FIRM was provided in digital format by the NCFMP. The source of this information can be determined from the metadata available in the digital FLOOD database and in the Technical Support Data Notebook (TSDN).

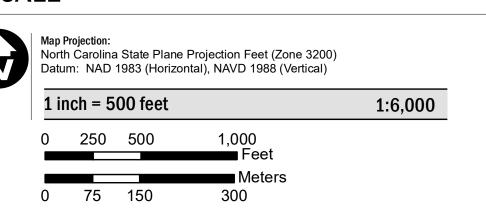
ACCREDITED LEVEE NOTES TO USERS: If an accredited levee note appears on this panel check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at https://www.fema.gov/national-flood-insurance-program.

PROVISIONALLY ACCREDITED LEVEE NOTES TO USERS: If a Provisionally Accredited Levee (PAL) note appears on this panel, check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To maintain accreditation, the levee owner or community is required to submit the data and documentation necessary to comply with Section 65.10 of the NFIP regulations. If the community or owner does not provide the necessary data and documentation or if the data and documentation provided indicate the levee system does not comply with Section 65.10 requirements, FEMA will revise the flood hazard and risk information for this area to reflect de-accreditation of the levee system. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at https://www.fema.gov/national-flood-insurance-program.

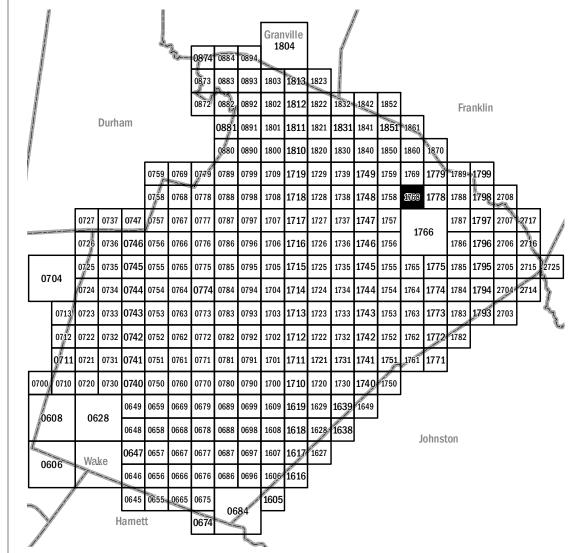
LIMIT OF MODERATE WAVE ACTION NOTES TO USERS: For some coastal flooding zones the AE Zone category has been divided by a Limit of Moderate Wave Action (LiMWA). The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LiMWA (or between the shoreline and the LiMWA for areas where VE Zones are not identified) will be similar to, but less severe than those in the VE Zone.

Limit of Moderate Wave Action (LiMWA)

SCALE



PANEL LOCATOR



Program NORTH CAROLINA FLOODPLAIN MAPPING PROGRAM NATIONAL FLOOD INSURANCE PROGRAM FLOOD INSURANCE RATE MAP

NORTH CAROLINA

PANEL 1768



Panel Contains:

COMMUNITY ROLESVILLE, TOWN OF WAKE COUNTY

Insurance

National Flood

CID PANEL SUFFIX 370468 1768 370368 1768



VERSION NUMBER 2.3.3.2 **MAP NUMBER** 3720176800K **MAP REVISED** July 19, 2022

APPENDIX B USACE DETERMINATIONS

From: Capito, Rachel Ann CIV USARMY CESAW (USA)

To: <u>Cory Darnell</u>

Subject: SAW-2024-02149 Delineation Concurrence Date: Wednesday, May 14, 2025 4:22:51 PM

Attachments: SAW-2024-02149 DC Map.pdf

You don't often get email from rachel.a.capito@usace.army.mil. Learn why this is important

All,

Please reference your request for the above referenced property, Corps Action ID: SAW-2024-02149. By copy of this e-mail, we are confirming that the delineation depicted on the attached map labeled Preliminary Jurisdictional Determination WOTUS Sketch Map 1216 Rolesville Road Property and dated 10/28/2024, is verified by our office and is a sufficiently accurate representation of the geographic boundaries of the aquatic resources located on the site.

Regulatory Guidance Letter (RGL) 16-01 provides guidance for Jurisdictional Determinations (JDs) and states, "The Corps generally does not issue a JD of any type where no JD has been requested" and in "certain circumstances where a JD would not be necessary." This delineation may be relied upon for use in the permit evaluation process with our office, including determining proposed impacts and compensatory mitigation. This delineation verification is not an Approved Jurisdictional Determination (AJD) and is not an appealable action under the Regulatory Program Administrative Appeal Process (33 CFR Part 331).

Unless a future request is received that requires additional review, no further correspondence will be forthcoming, and the Corps considers this request complete.

Thanks,

Rachel

Rachel Capito
Project Manager
Wilmington District
U.S. Army Corps of Engineers
3331 Heritage Trade Drive, Suite 105
Wake Forest, NC 27587
919.440.1823

We would appreciate your feedback on how we are performing our duties. Our automated Customer Service Survey is located at: http://corpsmapu.usace.army.mil/cm apex/f?p=136:4:0 Thank you for taking the time to visit this site and complete the survey.



APPENDIX C NRCS SOILS REPORT

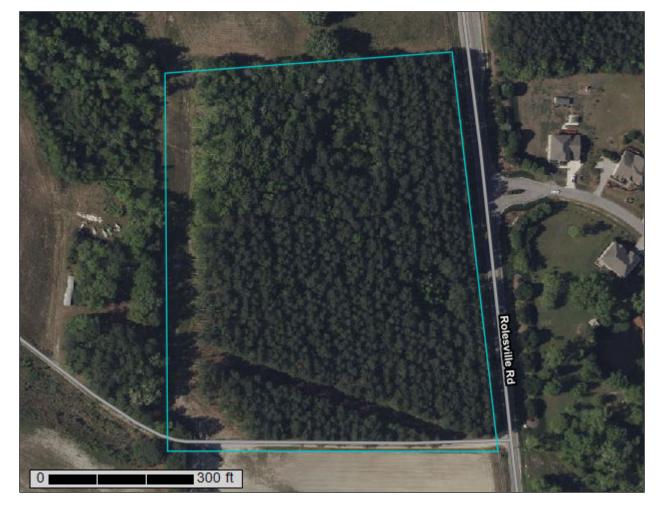


Natural Resources Conservation

Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Wake County, North Carolina



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2 053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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Contents

Preface	2
How Soil Surveys Are Made	
Soil Map	
Soil Map	
Legend	
Map Unit Legend	
Map Unit Descriptions	
Wake County, North Carolina	
HeB—Helena sandy loam, 2 to 6 percent slopes	13
RgB—Rawlings-Rion complex, 2 to 6 percent slopes	
WeB—Wedowee sandy loam, 2 to 6 percent slopes	
WfB—Wedowee-Saw complex, 2 to 6 percent slopes	16
Soil Information for All Uses	19
Soil Properties and Qualities	19
Soil Qualities and Features	19
Map Unit Name	
References	

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

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scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

-

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

pec:

Blowout

 \boxtimes

Borrow Pit

Ж

Clay Spot

 \Diamond

Closed Depression

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Gravel Pit

۰

Gravelly Spot

0

Landfill Lava Flow

٨

Marsh or swamp

@

Mine or Quarry

0

Miscellaneous Water
Perennial Water

0

Rock Outcrop

4

Saline Spot

. .

Sandy Spot

Severely Eroded Spot

Sinkhole

8

Slide or Slip

Ø

Sodic Spot

__.._

8

Spoil Area Stony Spot

m

Very Stony Spot

3

Wet Spot Other

Δ

Special Line Features

Water Features

_

Streams and Canals

Transportation

ransp

Rails

~

Interstate Highways

US Routes

 \sim

Major Roads

 \sim

Local Roads

Background

The same

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24.000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Wake County, North Carolina Survey Area Data: Version 26, Sep 9, 2024

Soil map units are labeled (as space allows) for map scales 1:50.000 or larger.

Date(s) aerial images were photographed: Apr 24, 2022—May 9, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
HeB	Helena sandy loam, 2 to 6 percent slopes	0.4	3.1%
RgB Rawlings-Rion complex, 2 to 6 percent slopes		5.4	46.0%
WeB Wedowee sandy loam, 2 to 6 percent slopes		4.6	39.3%
WfB Wedowee-Saw complex, 2 to 6 percent slopes		1.4	11.7%
Totals for Area of Interest		11.8	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

Custom Soil Resource Report

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Wake County, North Carolina

HeB—Helena sandy loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2qqgq

Elevation: 70 to 560 feet

Mean annual precipitation: 39 to 47 inches Mean annual air temperature: 55 to 63 degrees F

Frost-free period: 200 to 250 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Helena and similar soils: 92 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Helena

Setting

Landform: Interfluves

Landform position (two-dimensional): Summit, shoulder Landform position (three-dimensional): Side slope

Down-slope shape: Convex Across-slope shape: Convex

Parent material: Residuum weathered from granite and gneiss

Typical profile

Ap - 0 to 12 inches: sandy loam BE - 12 to 19 inches: sandy clay loam

Bt1 - 19 to 39 inches: clay Bt2 - 39 to 43 inches: clay loam BCg - 43 to 46 inches: clay loam C - 46 to 80 inches: sandy loam

Properties and qualities

Slope: 2 to 6 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately

low (0.00 to 0.06 in/hr)

Depth to water table: About 18 to 30 inches

Frequency of flooding: None Frequency of ponding: None

Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2e

Hydrologic Soil Group: D

Ecological site: F136XY810SC - Acidic upland forest, seasonally wet

Hydric soil rating: No

RgB—Rawlings-Rion complex, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2xhb9

Elevation: 70 to 560 feet

Mean annual precipitation: 39 to 47 inches Mean annual air temperature: 55 to 63 degrees F

Frost-free period: 200 to 250 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Rawlings and similar soils: 55 percent Rion and similar soils: 35 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rawlings

Setting

Landform: Interfluves

Landform position (two-dimensional): Summit, shoulder Landform position (three-dimensional): Interfluve

Down-slope shape: Convex Across-slope shape: Convex

Parent material: Residuum weathered from granite

Typical profile

Ap - 0 to 8 inches: sandy loam

Bt - 8 to 20 inches: sandy clay loam

C - 20 to 40 inches: gravelly sandy loam

R - 40 to 80 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately

low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2e

Hydrologic Soil Group: C

Ecological site: F136XY830NC - Acidic upland forest, depth restriction, dry-moist

Hydric soil rating: No

Description of Rion

Setting

Landform: Interfluves

Landform position (two-dimensional): Summit, shoulder Landform position (three-dimensional): Interfluve

Down-slope shape: Convex Across-slope shape: Convex

Parent material: Saprolite derived from granite and gneiss

Typical profile

Ap - 0 to 8 inches: sandy loam

Bt1 - 8 to 17 inches: sandy clay loam

Bt2 - 17 to 38 inches: sandy loam

C - 38 to 80 inches: sandy loam

Properties and qualities

Slope: 2 to 6 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high

(0.57 to 1.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2e

Hydrologic Soil Group: B

Ecological site: F136XY820GA - Acidic upland forest, moist

Hydric soil rating: No

WeB—Wedowee sandy loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2xn40

Elevation: 70 to 560 feet

Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F

Frost-free period: 200 to 250 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Wedowee and similar soils: 94 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wedowee

Setting

Landform: Interfluves

Landform position (two-dimensional): Summit, shoulder Landform position (three-dimensional): Interfluve

Down-slope shape: Convex Across-slope shape: Convex

Parent material: Saprolite residuum weathered from granite and gneiss and/or

saprolite residuum weathered from schist

Typical profile

Ap - 0 to 4 inches: sandy loam
E - 4 to 7 inches: sandy loam
BC - 23 to 35 inches: clay loam
C - 35 to 80 inches: sandy clay loam

Properties and qualities

Slope: 2 to 6 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high

(0.57 to 1.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2e

Hydrologic Soil Group: B

Ecological site: F136XY820GA - Acidic upland forest, moist

Hydric soil rating: No

WfB—Wedowee-Saw complex, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2xn42

Elevation: 70 to 560 feet

Mean annual precipitation: 39 to 47 inches Mean annual air temperature: 55 to 63 degrees F

Frost-free period: 200 to 250 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Wedowee and similar soils: 60 percent Saw and similar soils: 35 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wedowee

Setting

Landform: Interfluves

Landform position (two-dimensional): Summit, shoulder Landform position (three-dimensional): Interfluve

Down-slope shape: Convex Across-slope shape: Convex

Parent material: Saprolite residuum weathered from granite and gneiss and/or

saprolite residuum weathered from schist

Typical profile

Ap - 0 to 4 inches: sandy loam
E - 4 to 7 inches: sandy loam
BC - 23 to 35 inches: clay loam
C - 35 to 80 inches: sandy clay loam

Properties and qualities

Slope: 2 to 6 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high

(0.57 to 1.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2e

Hydrologic Soil Group: B

Ecological site: F136XY820GA - Acidic upland forest, moist

Hydric soil rating: No

Description of Saw

Setting

Landform: Interfluves

Landform position (two-dimensional): Summit, shoulder Landform position (three-dimensional): Interfluve

Down-slope shape: Convex Across-slope shape: Convex

Parent material: Residuum weathered from granite and gneiss

Typical profile

Ap - 0 to 8 inches: sandy loam

Bt - 8 to 20 inches: clay

BC - 20 to 26 inches: sandy clay loam
C - 26 to 29 inches: sandy loam
R - 29 to 80 inches: bedrock

Properties and qualities

Slope: 2 to 6 percent

Depth to restrictive feature: 20 to 40 inches to lithic bedrock

Drainage class: Well drained

Custom Soil Resource Report

Capacity of the most limiting layer to transmit water (Ksat): Very low to low (0.00 to

0.01 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2e

Hydrologic Soil Group: C

Ecological site: F136XY830NC - Acidic upland forest, depth restriction, dry-moist

Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

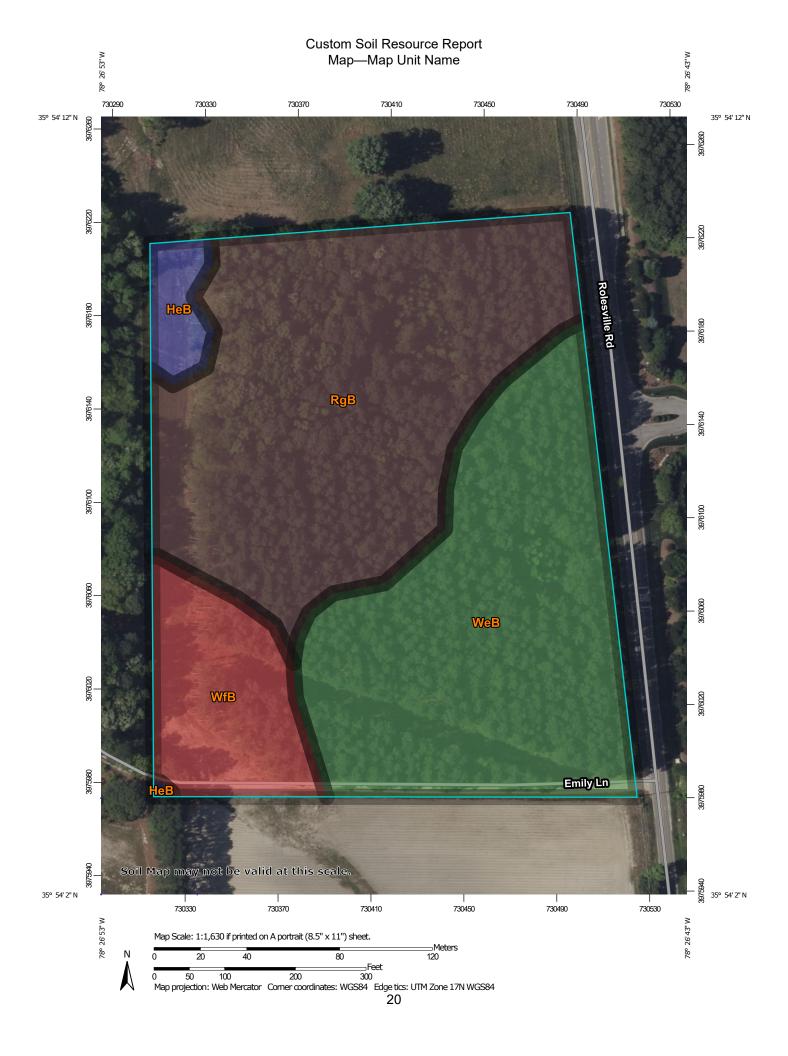
The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Map Unit Name

A soil map unit is a collection of soil areas or nonsoil areas (miscellaneous areas) delineated in a soil survey. Each map unit is given a name that uniquely identifies the unit in a particular soil survey area.



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- Helena sandy loam, 2 to 6 percent slopes
- Rawlings-Rion complex, 2 to 6 percent slopes
- Wedowee sandy loam, 2 to 6 percent slopes
 Wedowee-Saw complex,
- 2 to 6 percent slopes

 Not rated or not available

Soil Rating Lines

- Helena sandy loam, 2 to 6 percent slopes
- Rawlings-Rion complex, 2 to 6 percent slopes
- Wedowee sandy loam, 2 to 6 percent slopes
- Wedowee-Saw complex, 2 to 6 percent slopes
- Not rated or not available

Soil Rating Points

Helena sandy loam, 2 to 6 percent slopes

- Rawlings-Rion complex, 2 to 6 percent slopes
- Wedowee sandy loam, 2 to 6 percent slopes
- Wedowee-Saw complex, 2 to 6 percent slopes
- Not rated or not available

Water Features

Streams and Canals

Transportation

HH Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24.000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Wake County, North Carolina Survey Area Data: Version 26, Sep 9, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 24, 2022—May 9, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Custom Soil Resource Report

Table—Map Unit Name

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI	
НеВ	Helena sandy loam, 2 to 6 percent slopes	Helena sandy loam, 2 to 6 percent slopes	0.4	3.1%	
RgB	Rawlings-Rion complex, 2 to 6 percent slopes	Rawlings-Rion complex, 2 to 6 percent slopes	5.4	46.0%	
WeB	Wedowee sandy loam, 2 to 6 percent slopes	Wedowee sandy loam, 2 to 6 percent slopes	4.6	39.3%	
WfB	Wedowee-Saw complex, 2 to 6 percent slopes	Wedowee-Saw complex, 2 to 6 percent slopes	1.4	11.7%	
Totals for Area of Intere	est	11.8	100.0%		

Rating Options—Map Unit Name

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

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APPENDIX D RAINFALL DEPTHS



NOAA Atlas 14, Volume 2, Version 3 Location name: Wake Forest, North Carolina, USA* Latitude: 35.902°, Longitude: -78.4461° Elevation: 397 ft**

* source: ESRI Maps ** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley NOAA, National Weather Service, Silver Spring, Maryland

PF tabular | PF graphical | Maps & aerials

PF tabular

PDS	S-based p	oint preci	pitation f					ce interva	als (in inc	hes) ¹
Duration						ce interval (, ,			
	1	2	5	10	25	50	100	200	500	1000
5-min	0.403 (0.369-0.442)	0.468 (0.429-0.512)	0.533 (0.489-0.582)	0.600 (0.548-0.654)	0.666 (0.606-0.726)	0.719 (0.652-0.784)	0.766 (0.690-0.835)	0.808 (0.724-0.882)	0.854 (0.759-0.933)	0.897 (0.790-0.982)
10-min	0.644 (0.590-0.705)	0.749 (0.687-0.818)	0.854 (0.783-0.932)	0.959 (0.877-1.05)	1.06 (0.966-1.16)	1.14 (1.04-1.25)	1.22 (1.10-1.33)	1.28 (1.15-1.40)	1.35 (1.20-1.48)	1.41 (1.24-1.55)
15-min	0.806 (0.738-0.882)	0.942 (0.863-1.03)	1.08 (0.990-1.18)	1.21 (1.11-1.32)	1.34 (1.22-1.47)	1.45 (1.31-1.58)	1.54 (1.39-1.68)	1.62 (1.45-1.76)	1.70 (1.51-1.86)	1.77 (1.56-1.94)
30-min	1.10 (1.01-1.21)	1.30 (1.19-1.42)	1.54 (1.41-1.68)	1.76 (1.61-1.92)	1.99 (1.81-2.17)	2.18 (1.98-2.38)	2.36 (2.12-2.57)	2.52 (2.25-2.75)	2.71 (2.41-2.96)	2.87 (2.53-3.14)
60-min	1.38 (1.26-1.51)	1.63 (1.50-1.78)	1.97 (1.80-2.15)	2.29 (2.09-2.50)	2.65 (2.42-2.89)	2.96 (2.68-3.22)	3.25 (2.92-3.54)	3.53 (3.16-3.85)	3.88 (3.45-4.24)	4.19 (3.69-4.59)
2-hr	1.61 (1.46-1.78)	1.92 (1.75-2.10)	2.34 (2.12-2.56)	2.75 (2.49-3.01)	3.23 (2.91-3.54)	3.66 (3.29-4.00)	4.07 (3.63-4.45)	4.50 (3.98-4.92)	5.05 (4.43-5.52)	5.54 (4.82-6.07)
3-hr	1.71 (1.55-1.89)	2.03 (1.85-2.24)	2.48 (2.26-2.74)	2.94 (2.67-3.24)	3.50 (3.15-3.84)	4.00 (3.58-4.39)	4.49 (3.99-4.93)	5.01 (4.42-5.49)	5.70 (4.98-6.25)	6.34 (5.47-6.97)
6-hr	2.05 (1.87-2.26)	2.44 (2.23-2.68)	2.98 (2.72-3.28)	3.54 (3.22-3.88)	4.22 (3.82-4.62)	4.85 (4.35-5.30)	5.47 (4.87-5.97)	6.13 (5.40-6.68)	7.02 (6.11-7.66)	7.85 (6.74-8.58)
12-hr	2.41 (2.21-2.66)	2.87 (2.64-3.15)	3.54 (3.24-3.88)	4.22 (3.84-4.62)	5.07 (4.59-5.54)	5.85 (5.26-6.37)	6.65 (5.91-7.23)	7.51 (6.60-8.15)	8.69 (7.52-9.43)	9.79 (8.35-10.6)
24-hr	2.86 (2.66-3.08)	3.46 (3.22-3.73)	4.35 (4.04-4.69)	5.06 (4.69-5.45)	6.03 (5.57-6.49)	6.81 (6.27-7.33)	7.61 (6.99-8.20)	8.45 (7.73-9.11)	9.61 (8.74-10.4)	10.5 (9.53-11.4)
2-day	3.31 (3.08-3.57)	3.99 (3.72-4.30)	4.98 (4.64-5.37)	5.77 (5.36-6.21)	6.84 (6.33-7.37)	7.69 (7.09-8.29)	8.57 (7.88-9.24)	9.49 (8.68-10.2)	10.7 (9.77-11.6)	11.7 (10.6-12.7)
3-day	3.52 (3.28-3.77)	4.23 (3.94-4.54)	5.25 (4.89-5.63)	6.06 (5.64-6.50)	7.17 (6.64-7.69)	8.06 (7.45-8.65)	8.97 (8.26-9.63)	9.92 (9.09-10.7)	11.2 (10.2-12.1)	12.3 (11.1-13.2)
4-day	3.72 (3.47-3.98)	4.46 (4.17-4.77)	5.52 (5.15-5.90)	6.35 (5.92-6.79)	7.50 (6.96-8.02)	8.43 (7.80-9.01)	9.37 (8.64-10.0)	10.3 (9.50-11.1)	11.7 (10.7-12.6)	12.8 (11.6-13.7)
7-day	4.31 (4.04-4.61)	5.15 (4.82-5.50)	6.29 (5.88-6.71)	7.20 (6.72-7.68)	8.44 (7.86-9.01)	9.43 (8.76-10.1)	10.5 (9.67-11.2)	11.5 (10.6-12.3)	13.0 (11.9-13.9)	14.1 (12.9-15.2)
10-day	4.91 (4.61-5.24)	5.85 (5.48-6.23)	7.05 (6.60-7.51)	7.99 (7.47-8.51)	9.26 (8.64-9.87)	10.3 (9.56-11.0)	11.3 (10.5-12.1)	12.3 (11.4-13.2)	13.8 (12.7-14.7)	14.9 (13.6-15.9)
20-day	6.59 (6.20-7.02)	7.79 (7.32-8.29)	9.23 (8.67-9.82)	10.4 (9.73-11.0)	11.9 (11.2-12.7)	13.1 (12.3-14.0)	14.4 (13.4-15.3)	15.6 (14.5-16.7)	17.3 (16.0-18.5)	18.6 (17.1-20.0)
30-day	8.18 (7.72-8.69)	9.63 (9.08-10.2)	11.2 (10.6-11.9)	12.5 (11.7-13.2)	14.1 (13.2-15.0)	15.4 (14.4-16.4)	16.6 (15.5-17.7)	17.9 (16.7-19.1)	19.6 (18.2-20.9)	20.9 (19.3-22.3)
45-day	10.4 (9.89-11.0)	12.2 (11.6-12.9)	14.0 (13.3-14.8)	15.4 (14.6-16.2)	17.2 (16.3-18.2)	18.6 (17.5-19.6)	19.9 (18.8-21.1)	21.3 (20.0-22.5)	23.0 (21.5-24.4)	24.3 (22.7-25.8)
60-day	12.5 (11.9-13.1)	14.6 (13.9-15.4)	16.6 (15.7-17.4)	18.1 (17.2-19.0)	20.0 (19.0-21.1)	21.5 (20.3-22.6)	22.9 (21.6-24.1)	24.3 (22.9-25.6)	26.1 (24.5-27.6)	27.4 (25.7-29.0)

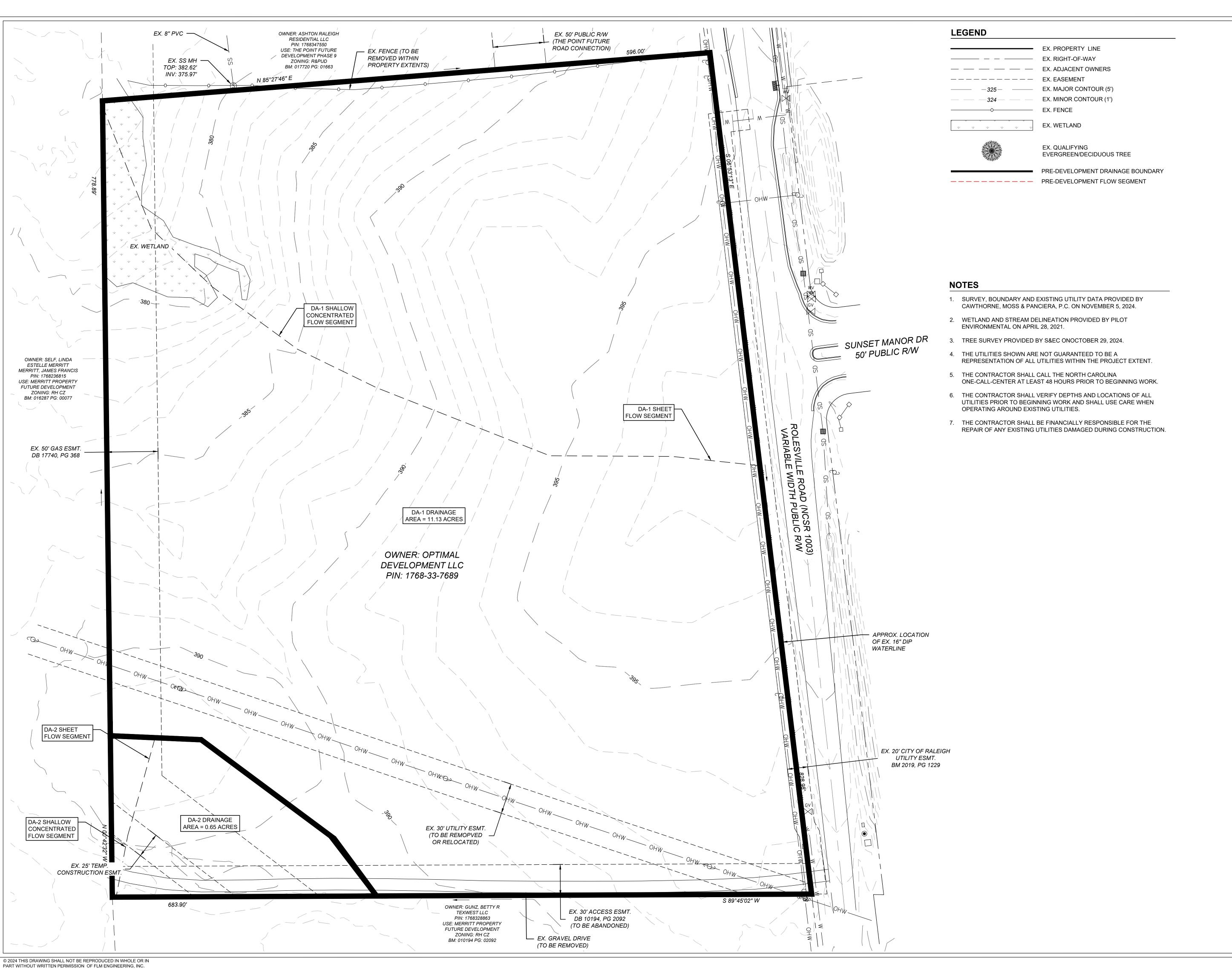
Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

APPENDIX E PRE-DEVELOPMENT WATERSHED MAP



ENGINEERING

POST OFFICE BOX 91727 RALEIGH, NORTH CAROLINA 27675 PHONE: 919.610.1051 FIRM NC LICENSE NUMBER C-4222

DESCRIPTION DATE BY

REVISION HISTORY

ORIGINAL PLAN SIZE: 24" X 36"

PRELIMINARY
PLANS
DO NOT USE FOR CONSTRUCTION

40 20 0 4 SCALE: 1 INCH = 40 FEET

SCALE ADJUSTMENT

THIS BAR IS 1 INCH IN LENGTH
ON ORIGINAL DRAWING

0 1"

IF IT IS NOT 1 INCH ON THIS
SHEET, ADJUST YOUR SCALE
ACCORDINGLY

PRELIMINARY SUBDIVISION PLAT PSP-25-01

ROLESVILLE RD MIXED USE 1216 ROLESVILLE RD ROLESVILLE, NC 27571

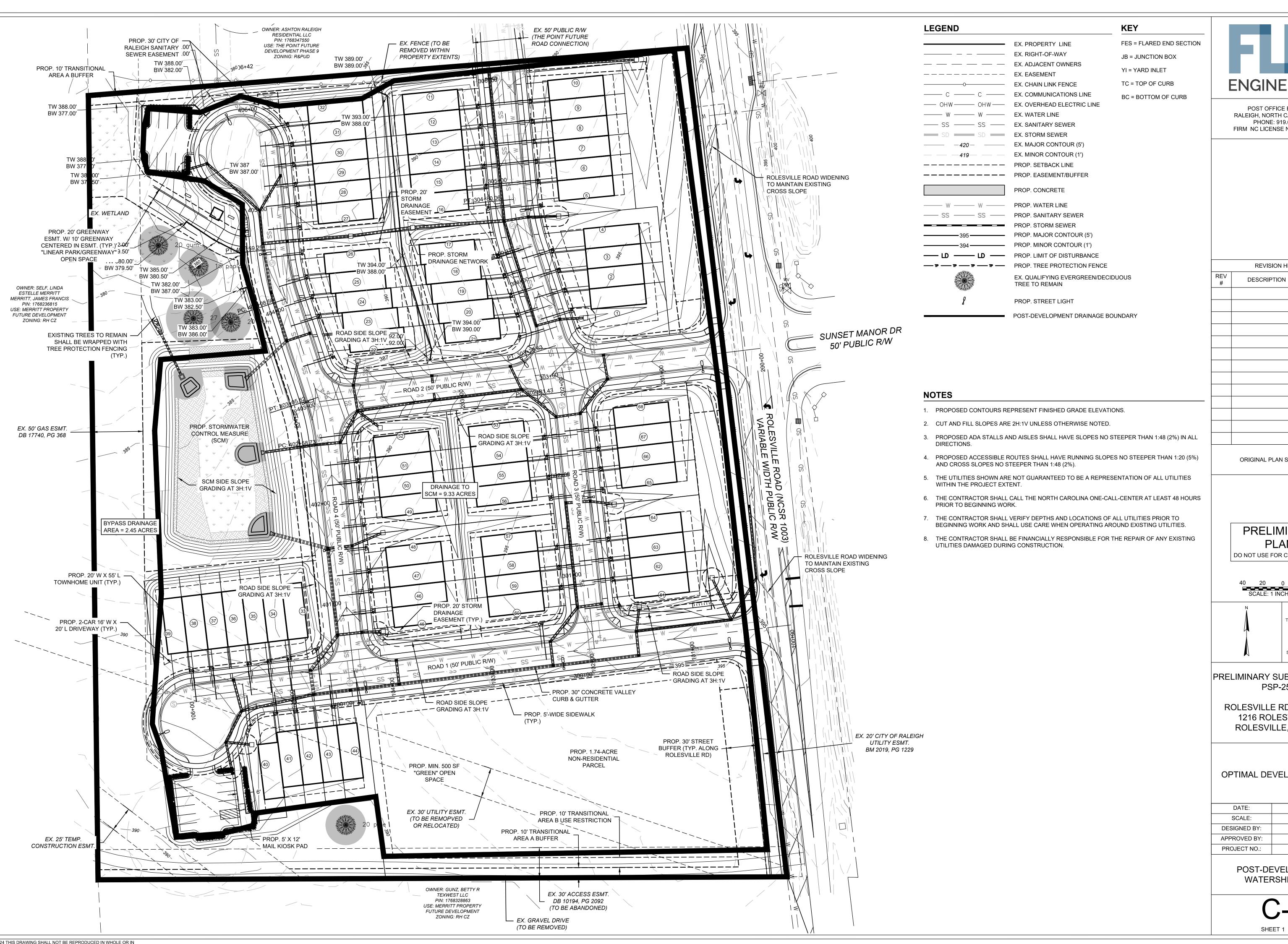
OPTIMAL DEVELOPMENT LLC

DATE:	12-12-2024
<i>D/</i> (12.	12 12 2021
SCALE:	AS SHOWN
DESIGNED BY:	FLM
APPROVED BY:	FLM
PROJECT NO.:	21029

PRE-DEVELOPMENT WATERSHED MAP

C-1SHEET 1 OF 1

APPENDIX F POST-DEVELOPMENT WATERSHED MAP



ENGINEERING

POST OFFICE BOX 91727 RALEIGH, NORTH CAROLINA 27675 PHONE: 919.610.1051 FIRM NC LICENSE NUMBER C-4222

REVISION HISTORY

DATE BY

ORIGINAL PLAN SIZE: 24" X 36"

PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION

SCALE: 1 INCH = 40 FEET SCALE ADJUSTMENT THIS BAR IS 1 INCH IN LENGTH ON ORIGINAL DRAWING IF IT IS NOT 1 INCH ON THIS SHEET, ADJUST YOUR SCALE ACCORDINGLY

PRELIMINARY SUBDIVISION PLAT PSP-25-01

ROLESVILLE RD MIXED USE 1216 ROLESVILLE RD ROLESVILLE, NC 27571

OPTIMAL DEVELOPMENT LLC

DATE:	12-12-2024
SCALE:	AS SHOWN
DESIGNED BY:	FLM
APPROVED BY:	FLM
PROJECT NO.:	21029

POST-DEVELOPMENT WATERSHED MAP

SHEET 1 OF 1

APPENDIX G WAKE COUNTY STORMWATER MUNICIPAL TOOL



SITE DATA

		Project Information
	Project Name:	1216 Rolesville Road
	Applicant:	FLM Engineering
	Applicant Contact Name:	Chase Massey
	Applicant Contact Number:	919-423-8975
	Contact Email:	cmassey@flmengineering.com
	Municipal Jurisdiction (Select from dropdown menu):	Rolesville
	Last Updated:	
		Site Data:
	Total Site Area (Ac):	11.78
	Existing Lake/Pond Area (Ac):	0.00
	Proposed Disturbed Area (Ac):	9.80
	Impervious Surface Area (acre):	5.06
	Type of Development (Select from Dropdown menu):	Residential
	Percent Built Upon Area (BUA):	43%
	Project Density:	High
	Is the proposed project a site expansion?	No No
	Number of Drainage Areas on Site:	2
	1-Year, 24-Hour Storm (inches) (See NOAA Website):	2.86
NOAA	2-Year, 24-Hour Storm (inches) (See NOAA Website):	3.46
NOZA	10-Year, 24-Hour Storm (inches) (See NOAA Website):	5.06
	io isai, 2 i isai sisiii (iisiisa) (eee itara i iisaala).	Lot Data (if applicable):
	Total Acreage in Lots:	Lot Data (II applicable).
	Number of Lots:	
	Average Lot Size (SF):	
	Total Impervious Surface Area on Lots (SF):	
	Average Impervious Surface Area Per Lot (SF):	
	·	characters - attach additional pages with submittal if necessary):
	0.0	The second secon
lots, and one lot	for future commerical use. The future commerical lot is accoun	tolesville. The exisigng site is vacant and mostly wooded areas. The proposed subdivision includes 68 townhomes ted for in the stormwater calculations and is treated by the proposed SCM. Proposed impervious areas include the and trail. The future commerical parcel was assumed to be 80% impervious area (41,417 sf of impervious area).

SITE DATA Page 1





<u>DRAINAGE AREA 1</u> <u>STORMWATER PRE-POST CALCULATIONS</u>

LAND USE & SITE DATA	Р	RE-DEVE	LOPMEN	NT	P	OST-DEV	ELOPME	NT
Drainage Area (Acres)=		11	.13			11	.13	
Site Acreage within Drainage=		11	.13			11	.13	
One-year, 24-hour rainfall (in)=				2.	86			
Two-year, 24-hour rainfall (in)=				3.4	46			
Ten-year, 24-hour storm (in)=				5.0	06			
Total Lake/Pond Area (Acres)=		0.	00			0.	00	
Lake/Pond Area not in the Tc flow path (Acres)=		0.	00			0.	00	
Site Land Use (acres):	Α	В	С	D	Α	В	С	D
Pasture								
Woods, Poor Condition								
Woods, Fair Condition								
Woods, Good Condition		4.50	5.10	0.32			0.05	0.22
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition		0.76	0.30	0.04		2.80	2.91	0.15
Reforestation (in dedicated OS)								
Connected Impervious		0.11				5.00		
Disconnected Impervious								
SITE FLOW	PR	E-DEVEL	OPMEN	Г Т _с	PO	ST-DEVE	LOPMEN	T Tc
Sheet Flow								
Length (ft)=		100	0.00					
Slope (ft/ft)=		0.0	010					
Surface Cover:		Gr	ass					
n-value=		0.2	240					
T_{t} (hrs)=		0.3	332					
Shallow Flow								
Length (ft)=		689	9.00					
Slope (ft/ft)=		0.0)30					
Surface Cover:		Unp	aved					
Average Velocity (ft/sec)=		2.	79					
T _t (hrs)=		0.	07					
Channel Flow 1								
Length (ft)=								
Slope (ft/ft)=								
Cross Sectional Flow Area (ft ²)=								
Wetted Perimeter (ft)=								
Channel Lining:								
n-value=								
Hydraulic Radius (ft)=			-				-	
Average Velocity (ft/sec)=								
T_{t} (hrs)=								

DA1 Page 2





<u>DRAINAGE AREA 1</u> <u>STORMWATER PRE-POST CALCULATIONS</u>

Channel Flow 2		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft²)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T _t (hrs)=		
Channel Flow 3		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft²)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T _t (hrs)=		
Tc (hrs)=	0.40	0.10
RESULTS	PRE-DEVELOPMENT	POST-DEVELOPMENT
Composite Curve Number=	64	82
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
CN _{adjusted (1-year)} =	8	2
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft ³) =	18,5	355
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = Q* _{1-year} =		
Turion (mones) - Q _{1-year} -	0.41	1.25
Volume of runoff (ft ³) =	0.41 16,442	1.25 50,349
,		50,349
Volume of runoff (ft ³) =	16,442	50,349
Volume of runoff (ft^3) = Volume change (ft^3) =	16,442	50,349
Volume of runoff (ft^3) = Volume change (ft^3) = Peak Discharge (cfs)= Q_{1-year} =	16,442	50,349
Volume of runoff (ft ³) = Volume change (ft ³) = Peak Discharge (cfs)= Q _{1-year} = 2-year, 24-hour storm (LID)	16,442 33, 2.773	50,349 907 21.889
Volume of runoff (ft³) = Volume change (ft³) = Peak Discharge (cfs) = Q _{1-year} = 2-year, 24-hour storm (LID) Runoff (inches) = Q* _{2-year} =	16,442 33, 2.773 0.68	50,349 907 21.889
Volume of runoff (ft³) = Volume change (ft³) = Peak Discharge (cfs) = Q _{1-year} = 2-year, 24-hour storm (LID) Runoff (inches) = Q* _{2-year} = Volume of runoff (ft³) =	16,442 33, 2.773 0.68 27,563	50,349 907 21.889 1.72 69,582
Volume of runoff (ft^3) = Volume change (ft^3) = Peak Discharge (cfs) = $\mathrm{Q}_{1\text{-year}}$ = 2-year, 24-hour storm (LID) Runoff (inches) = $\mathrm{Q}^*_{2\text{-year}}$ = Volume of runoff (ft^3) = Peak Discharge (cfs) = $\mathrm{Q}_{2\text{-year}}$ =	16,442 33, 2.773 0.68 27,563	50,349 907 21.889 1.72 69,582
Volume of runoff (ft³) = Volume change (ft³) = Peak Discharge (cfs) = Q _{1-year} = 2-year, 24-hour storm (LID) Runoff (inches) = Q* _{2-year} = Volume of runoff (ft³) = Peak Discharge (cfs) = Q _{2-year} = 10-year, 24-hour storm (DIA)	16,442 33, 2.773 0.68 27,563 4.649	50,349 907 21.889 1.72 69,582 30.251

DA1 Page 3





<u>DRAINAGE AREA 2</u> <u>STORMWATER PRE-POST CALCULATIONS</u>

LAND USE & SITE DATA	Р	RE-DEVE	LOPME	NT	PC	OST-DEV	ELOPME	NT
Drainage Area (Acres)=		0.	65			0.	65	
Site Acreage within Drainage=		0.	65			0.	65	
One-year, 24-hour rainfall (in)=				2.	86			
Two-year, 24-hour rainfall (in)=				3.	46			
Ten-year, 24-hour storm (in)=				5.	06			
Total Lake/Pond Area (Acres)=								
Lake/Pond Area not in the Tc flow path (Acres)=								
Site Land Use (acres):	Α	В	С	D	Α	В	С	D
Pasture								
Woods, Poor Condition								
Woods, Fair Condition								
Woods, Good Condition		0.28						
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition		0.31				0.59		
Reforestation (in dedicated OS)								
Connected Impervious		0.06				0.06		
Disconnected Impervious								
SITE FLOW	PR	E-DEVEL	OPMEN	T T _c	POS	T-DEVE	LOPMEN	T Tc
Sheet Flow								
Length (ft)=		100	0.00			100	0.00	
Slope (ft/ft)=		0.0)20			0.0)20	
Surface Cover:		Gr	ass			Gra	ass	
n-value=		0.2	240			0.2	240	
T _t (hrs)=		0.2	252			0.2	252	
Shallow Flow								
Length (ft)=		61	.00			61	.00	
Slope (ft/ft)=		0.0	033			0.0)33	
Surface Cover:		Unp	aved			Unp	aved	
Average Velocity (ft/sec)=		2.	93			2.	93	
T _t (hrs)=		0.	01			0.	01	
Channel Flow 1								
Length (ft)=								
Slope (ft/ft)=								
Cross Sectional Flow Area (ft²)=								
Wetted Perimeter (ft)=								
Channel Lining:								
n-value=								
Hydraulic Radius (ft)=								
Average Velocity (ft/sec)=								
T _t (hrs)=								

DA2 Page 4





<u>DRAINAGE AREA 2</u> <u>STORMWATER PRE-POST CALCULATIONS</u>

Channel Flow 2		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft²)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T _t (hrs)=		
Channel Flow 3		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft²)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T _t (hrs)=		
Tc (hrs)=	0.26	0.17
RESULTS	PRE-DEVELOPMENT	POST-DEVELOPMENT
Composite Curve Number=	62	64
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
CN _{adjusted (1-year)} =	6	4
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft ³) =	31	14
1-year, 24-hour storm (Peak Flow)		
1-year, 24-hour storm (Peak Flow) Runoff (inches) = Q* _{1-year} =	0.34	0.42
	0.34 799	
Runoff (inches) = Q* _{1-year} =		0.42 999
Runoff (inches) = Q^*_{1-year} = Volume of runoff (ft^3) =	799	0.42 999
Runoff (inches) = Q^*_{1-year} = Volume of runoff (ft^3) = Volume change (ft^3) =	799	0.42 999
Runoff (inches) = Q^*_{1-year} = Volume of runoff (ft³) = Volume change (ft³) = Peak Discharge (cfs)= Q_{1-year} =	799	0.42 999
Runoff (inches) = Q^*_{1-year} = Volume of runoff (ft^3) = Volume change (ft^3) = Peak Discharge (cts)= Q_{1-year} = 2-year, 24-hour storm (LID)	799 20 0.144	0.42 999 00 0.266
Runoff (inches) = Q^*_{1-year} = Volume of runoff (ft^3) = Volume change (ft^3) = Peak Discharge (cfs) = Q_{1-year} = 2-year, 24-hour storm (LID)	799 20 0.144 0.59	0.42 999 00 0.266
Runoff (inches) = Q^*_{1-year} = Volume of runoff (ft^3) = Volume change (ft^3) = Peak Discharge (cfs) = Q_{1-year} = 2-year, 24-hour storm (LID) Runoff (inches) = Q^*_{2-year} = Volume of runoff (ft^3) =	799 20 0.144 0.59 1,391	0.42 999 00 0.266 0.70 1,661
Runoff (inches) = Q^*_{1-year} = Volume of runoff (ft^3) = Volume change (ft^3) = Peak Discharge (cfs) = Q_{1-year} = 2-year, 24-hour storm (LID) Runoff (inches) = Q^*_{2-year} = Volume of runoff (ft^3) = Peak Discharge (cfs) = Q_{2-year} =	799 20 0.144 0.59 1,391	0.42 999 00 0.266 0.70 1,661
Runoff (inches) = Q^*_{1-year} = Volume of runoff (ft^3) = Volume change (ft^3) = Peak Discharge (cfs) = Q_{1-year} = 2-year, 24-hour storm (LID) Runoff (inches) = Q^*_{2-year} = Volume of runoff (ft^3) = Peak Discharge (cfs) = Q_{2-year} = 10-year, 24-hour storm (DIA)	799 20 0.144 0.59 1,391 0.250	0.42 999 00 0.266 0.70 1,661 0.442



<u>DA SITE SUMMARY</u> STORMWATER PRE-POST CALCULATIONS

Project Name:

		SITE	SUMMAR	v						
DRAINAGE AREA SUMMARIES		SIIE	SUIVIIVIAR	ı						
DRAINAGE AREA:	DA1	DA2	DA3	DA4	DA5	DA6	DA7	DA8	DA9	DA10
DIVANNACE AINEA.			(1-year, 24			DAO	DAI	DAO	DAS	DATO
Runoff (in) = $Q_{pre,1-year}$ =	0.41	0.34								
Peak Flow (cfs)=Q _{1-year} =	2.773	0.144								
	Post-Dev	elopment	(1-year, 24	-hour sto	rm)					
Proposed Impervious Surface (acre) =	5.00	0.06								
Runoff (in)= Q_{1-year} =	1.25	0.42								
Peak Flow (cfs)=Q _{1-year} =	21.889	0.266								
Increase in volume per DA (ft³)_1-yr storm=	33,907	200								
Minimum Volume to be Managed for DA HIGH DENSITY REQUIREMENT = (ft ³) =	18,355	314								
TARGET CURVE NUMBER (TCN)										
		S	ite Data							
		SITE \SOIL	COMPOSI	TION		1		1		
HYDROLOGIC SOIL GRO	UP			Site	<u>Area</u>		<u>%</u>		Target CN	<u>l</u>
А				0.	00	C	1%		N/A	
В				8.4	45	7:	2%		N/A	
С				2.	96	2	5%		N/A	
D					37	3	1%		N/A	
			tal Site Area					.78		
Percent B	SUA (Include	es Existing	Lakes/Pond					3%		
				Density =				igh		
		Target C	urve Numbe	• •				/A		
				sted (1-year)=				31		
Minimum Volume to be Mana	• •	<u> </u>					N	/A		
		ite Nitrog	en Loading TN export	Data				l .		
HSG			coefficient (lbs/ac/yr)			Site Acreage			N Export	
Pasture			1.2			0.00			0.00	
Woods, Poor Condition			1.6			0.00			0.00	
Woods, Fair Condition			1.2			0.00			0.00	
Woods, Good Condition			8.0			0.27			0.22	
Open Space, Poor Condition			1.0			0.00			0.00	
Open Space, Fair Condition			0.8			0.00			0.00	
Open Space, Good Condition			0.6			6.45			3.87	
Reforestation (in dedicated OS)			0.6			0.00			0.00	
Impervious			21.2			5.06			107.27	
SITE NITROGEN LOADING RATE						9.45				
Nitrogen Lo						111.36				
TOTAL SITE NITROGEN TO MITIGATE (lbs/yr)_We						68.95				
S	ite Nitroge	n Loading	Data For E	xpansion	s Only					
			Existing					New		
Impervious(acres)=			NA					NA		
"Expansion Area" (acres=)										
Nitrogen Load (lbs/yr)=			NA					NA		
SITE NITROGEN LOADING RATE (lbs/ac/yr)=			NA					NA		
Total Site loading rate (lbs/ac/yr)										
TOTAL SITE NITROGEN TO MITIGATE (lbs/yr)=					N/	4				

SITE SUMMARY Page 6

Project Name: 1216 Rolesville Road



DRAINAGE AREA 1 BMP CALCULATIONS

ND ADJUSTMENTS										
			11.13	3						
			N/A							
			18,35	55						
No	Enter %	of the year	water will be reused=							
AREAS IN DA										
	Sub-I	DA1(a)	Sub-E	DA1(b)	Sub-I	DA1(c)	Sub-I	DA1(d)	Sub-E	DA1(e)
HSG										Off-site
	Site	OII-Site	Site	OII-Site	Site	OII-Site	Site	OII-Site	Site	OII-Site
	4 44									
	7.77									
	4 80									
	4.09									
Device Type							Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
Stormwater Wetlands							40%	106.33	42.53	75.4
							0%	63.80	0.00	
		17,669			18,468		0%	63.80	0.00	
							0%	63.80	0.00	
							0%	63.80	0.00	
al Nitrogen remaining leaving the subbasin (lbs):					63	.80			1	
If Sub-DA1(b) is connected to upstream subbasin(s), ne nitrogen leaving the most upstream subbasin(lbs):										
Device Type							Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
							0%	0.00	0.00	
							0%	0.00	0.00	
							0%	0.00	0.00	
							0%	0.00	0.00	
al Nitrogen remaining leaving the subbasin (lbs):										
If Sub-DA1(c) is connected to upstream subbasin(s), ne nitrogen leaving the most upstream subbasin(lbs):				T			T	T	ı	
Device Type							Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
							0%	0.00	0.00	
							0%	0.00	0.00	
							0% 0%			
								0.00	0.00	
							0%	0.00	0.00	
	No AREAS IN DA HSG Device Type Stormwater Wetlands al Nitrogen remaining leaving the subbasin (lbs): Device Type Stormwater Wetlands If Sub-DA1(b) is connected to upstream subbasin(s), the nitrogen leaving the most upstream subbasin (lbs): Device Type Al Nitrogen remaining leaving the subbasin (lbs): Be nitrogen leaving the most upstream subbasin(s), the nitrogen leaving the most upstream subbasin(lbs):	AREAS IN DA HSG Sub- (4) Site Site	No Enter % of the year AREAS IN DA HSG Sub-DA1(a) (Ac) Site Off-site A.4.4 A.4.4 Device Type Water Quality Vc for Sub-DA (f Stormwater Wetlands If Sub-DA1(b) is connected to upstream subbasin(lbs): Device Type Water Quality Vc for Sub-DA (f Stormwater Wetlands) If Sub-DA1(b) is connected to upstream subbasin(lbs): Device Type Water Quality Vc for Sub-DA (f If Sub-DA1(b) is connected to upstream subbasin(lbs): Water Quality Vc for Sub-DA (f If Sub-DA1(c) is connected to upstream subbasin(lbs): Water Quality Vc for Sub-DA (f If Sub-DA1(c) is connected to upstream subbasin(lbs): Water Quality Vc for Sub-DA (f If Sub-DA1(c) is connected to upstream subbasin(lbs): Water Quality Vc for Sub-DA (f If Sub-DA1(c) is connected to upstream subbasin(lbs): Water Quality Vc for Sub-DA1(c) is connected to upstream subbasin(lbs):	No Enter % of the year water will be reused= AREAS IN DA HSG AREAS IN DA HSG AREAS IN DA HSG ALA4 Sub-DA1(a) Sub-DA1(b) Sub-D	No Enter % of the year water will be reused= AREAS IN DA Sub-DA1(a) Sub-DA1(b) (Ac)	No Enter % of the year water will be reuseds AREAS IN DA HSG Sub-DA1(a) Sub-DA1(b) Sub-UA1(b) Sub-U	No Enter % of the year water will be reuseds AREAS IN DA HSG Sub-DAt(a) Sub-DAt(b) Sub-DAt(c) (AC) (No	No	No

DA1_BMPs Page 7

Project Name: 1216 Rolesville Road



DRAINAGE AREA 1 BMP CALCULATIONS

NORTH CAROLINA							
Sub-DA1(d) BMP(s)							
If Sub-DA1(d) is connected to upstream subba	asin(s), enter the nitrogen leaving the most upstream subbasin(lbs):						
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft ³)	Provided Volume that will <u>drawdown 2-5 days</u> (ft ³)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Tota	al Nitrogen remaining leaving the subbasin (lbs):						
Sub-DA1(e) BMP(s)							
If Sub-DA1(e) is connected to upstream subba	asin(s), enter the nitrogen leaving the most upstream subbasin(lbs):						
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft³)	Provided Volume that will <u>drawdown 2-5 days</u> (ft ³)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Tota	al Nitrogen remaining leaving the subbasin (lbs):						
		A1 BMP SUMMARY	40.400				
	Total Volume Treated (ft³)=		18,468				
4	Nitrogen Mitigated(lbs)=		42.53				
1-year, 24-hour storm	3						
	Post BMP Volume of Runoff $(ft^3)_{(1-year)}$ = Post BMP Runoff (inches) = $Q^*_{(1-year)}$ =		31,881				
			0.79				
	Post BMP CN _(1-year) =		73				
	Post BMP Peak Discharge (cfs)= Q _{1-year} =		1.090				
2-year, 24-hour storm (LID)							
	Post BMP Volume of Runoff (ft3) _(2-year) =		51,114				
	Post BMP Runoff (inches) = Q* _(2-year) =		1.27				
	Post BMP CN _(2-year) =		74				
	Post BMP Peak Discharge (cfs)= Q _(2-year) =						
10-year, 24-hour storm (DIA)							
	Post BMP Volume of Runoff (ft ³) _(10-year) =		106,686				
<u> </u>	Post BMP Runoff (inches) = Q*(10-year)=		2.64				
	Post BMP CN(_{10-year})=		92				

DA1_BMPs Page 8



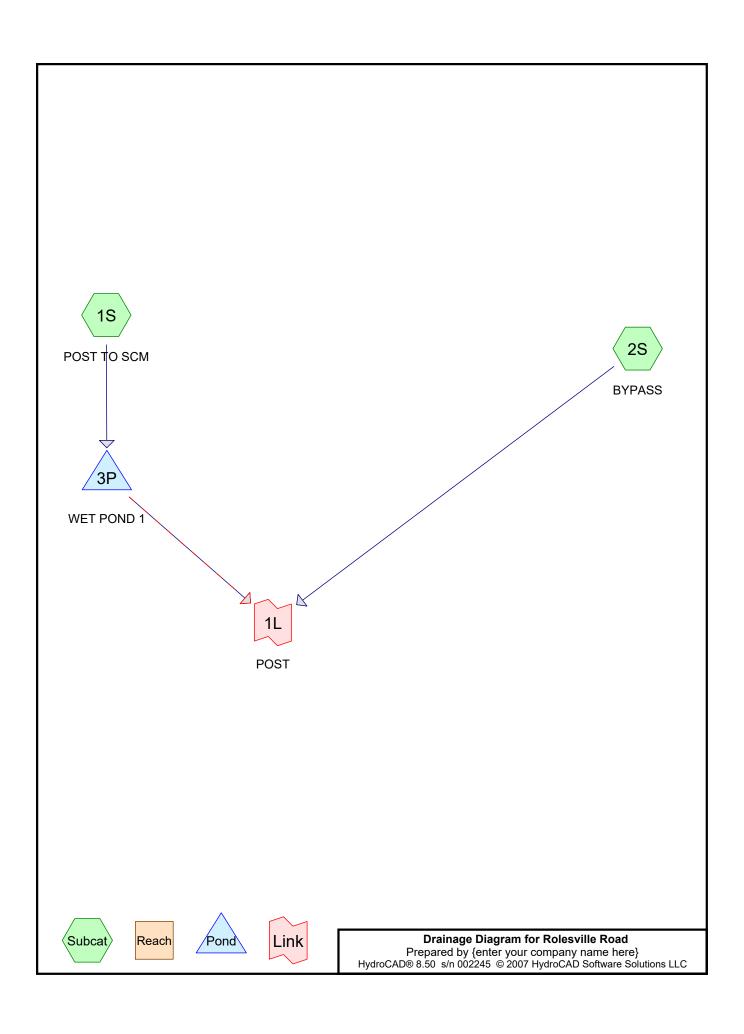
Project Name: 1216 Rolesville Road

DA SITE SUMMARY BMP CALCULATIONS

	ВМ	MP SUMN	IARY							
DRAINAGE AREA SUMMARIES										
DRAINAGE AREA:	DA1	DA2	DA3	DA4	DA5	DA6	DA7	DA8	DA9	DA10
Pre-	-Developm	ent (1-yea	r, 24-hour s	storm)						
Runoff (in)=Q* _{1-year} =	0.41	0.34								
Peak Flow (cfs)=Q _{1-year} =	2.773	0.144								
Post-Development (1-year, 24-hour storm)										
Target Curve Number (TCN) =					N.A	٨				
Post BMP Runoff (inches) = Q* _(1-year) =	0.79	0.42								
Post BMP Peak Discharge (cfs)= Q _{1-year} =	1.090									
Post BMP CN _(1-year) =					73	}				
	Post-BI	MP Nitroge	n Loading							
TOTAL SITE NITROGEN MITIGATED (lbs)=					42.5	53				
SITE NITROGEN LOADING RATE (lbs/ac/yr)=					5.8	4				
TOTAL SITE NITROGEN LEFT TO MITIGATE_Wendell Only (lbs)=					26.4	12				

BMP SUMMARY Page 9

APPENDIX H POST-DEVELOPMENT HYDROLOGIC MODEL



Area Listing (selected nodes)

Area	CN	Description
(acres)		(subcatchment-numbers)
2.300	61	>75% Grass cover, Good, HSG B (1S,2S)
0.050	70	Woods, Good, HSG C (2S)
3.960	74	>75% Grass cover, Good, HSG C (1S,2S)
0.220	77	Woods, Good, HSG D (2S)
0.190	80	>75% Grass cover, Good, HSG D (1S,2S)
5.060	98	Paved parking & roofs (1S,2S)
11.780		TOTAL AREA

Page 3

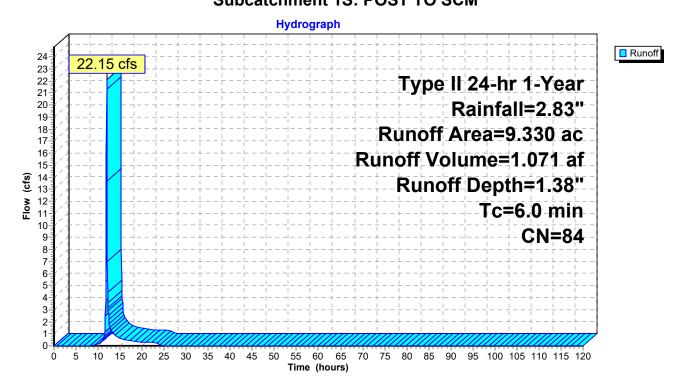
Summary for Subcatchment 1S: POST TO SCM

Runoff = 22.15 cfs @ 11.97 hrs, Volume= 1.071 af, Depth= 1.38"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-120.00 hrs, dt= 0.05 hrs Type II 24-hr 1-Year Rainfall=2.83"

_	Area ((ac)	CN	Desc	ription		
	2.	100	61	>75%	% Grass co	over, Good,	I, HSG B
	2.	190	74	>75%	% Grass co	over, Good,	I, HSG C
	0.	150	80	>75%	% Grass co	over, Good,	I, HSG D
_	4.8	890	98	Pave	d parking	& roofs	
	9.3	330	84	Weig	hted Aver	age	
	4.4	440		Perv	ious Area		
	4.8	890		Impe	rvious Are	ea	
	Тс	Lengt		Slope	Velocity	Capacity	Description
	(min)	(fee	t)	(ft/ft)	(ft/sec)	(cfs)	
	6.0						Direct Entry,

Subcatchment 1S: POST TO SCM



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Page 4

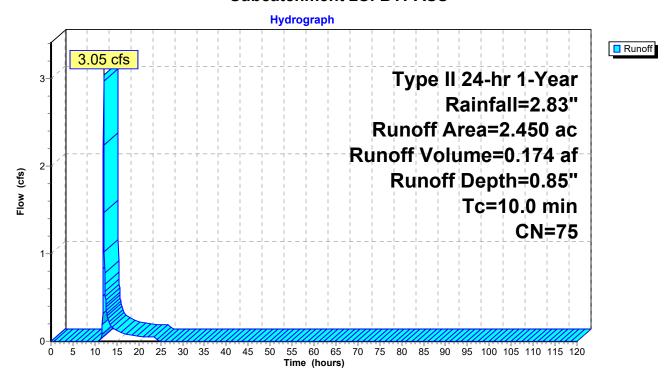
Summary for Subcatchment 2S: BYPASS

Runoff = 3.05 cfs @ 12.03 hrs, Volume= 0.174 af, Depth= 0.85"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-120.00 hrs, dt= 0.05 hrs Type II 24-hr 1-Year Rainfall=2.83"

Area	(ac)	CN	Desc	cription		
0.	.050	70	Woo	ds, Good,	HSG C	
0.	.220	77	Woo	ds, Good,	HSG D	
0.	200	61	>759	% Grass co	over, Good,	I, HSG B
1.	.770	74	>759	% Grass co	over, Good,	I, HSG C
0.	.040	80	>759	% Grass co	over, Good,	I, HSG D
0.	.170	98	Pave	ed parking	& roofs	
2.	450	75	Weig	ghted Aver	age	
2.	280		Perv	ious Area		
0.	170		Impe	ervious Are	a	
Tc	Leng	th :	Slope	Velocity	Capacity	Description
(min)	(fee	et)	(ft/ft)	(ft/sec)	(cfs)	
10.0						Direct Entry,

Subcatchment 2S: BYPASS



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Page 5

Summary for Pond 3P: WET POND 1

Inflow Area = 9.330 ac, 52.41% Impervious, Inflow Depth = 1.38" for 1-Year event

Inflow = 22.15 cfs @ 11.97 hrs, Volume= 1.071 af

Outflow = 1.09 cfs @ 13.30 hrs, Volume= 1.051 af, Atten= 95%, Lag= 79.4 min

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.05 hrs Peak Elev= 382.75' @ 13.30 hrs Surf.Area= 16,392 sf Storage= 26,510 cf

Plug-Flow detention time= 1,179.9 min calculated for 1.051 af (98% of inflow)

Center-of-Mass det. time= 1,169.0 min (2,001.1 - 832.1)

Volume	Inve	rt Avail.9	Storage	Storage Descriptio	n		
#1	381.0	0' 67	7,245 cf	Custom Stage Da	ta (Irregular)Listed	below	
Elevation	on :	Surf.Area	Perim.	Inc.Store	Cum.Store	Wet.Area	
(fee	et)	(sq-ft)	(feet)	(cubic-feet)	(cubic-feet)	(sq-ft)	
381.0	00	13,729	488.0	0	0	13,729	
382.0	00	15,224	507.0	14,470	14,470	15,314	
383.0	00	16,775	526.0	15,993	30,463	16,959	
384.0	00	18,383	545.0	17,573	48,036	18,664	
385.0	00	20,047	564.0	19,209	67,245	20,430	
Device	Routing	Inve	ert Outle	et Devices			
#1	Primary	381.0	0' 24.0	" x 48.0' long Culv	vert RCP, groove e	end projecting, Ke= 0.	200
	•		Outle	et Invert= 380.00' 3	S= 0.0208 '/' Cc=	0.900 n= 0.013	
#2	Device 1	381.0	0' 2.0"	Vert. Orifice C= 0	.600		
#3	Device 1	382.2	5' 12.0	" Vert. Orifice C=	0.600		
#4	Device 1	383.5	0' 4.00	' x 4.00' Horiz. Graf	te Limited to weir	flow $C = 0.600$	
#5	Secondar	ry 384.0		' long x 16.0' bread d (feet) 0.20 0.40		l Rectangular Weir 20 1.40 1.60	

Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=1.09 cfs @ 13.30 hrs HW=382.75' (Free Discharge)

1=Culvert (Passes 1.09 cfs of 16.20 cfs potential flow)

2=Orifice (Orifice Controls 0.14 cfs @ 6.22 fps)

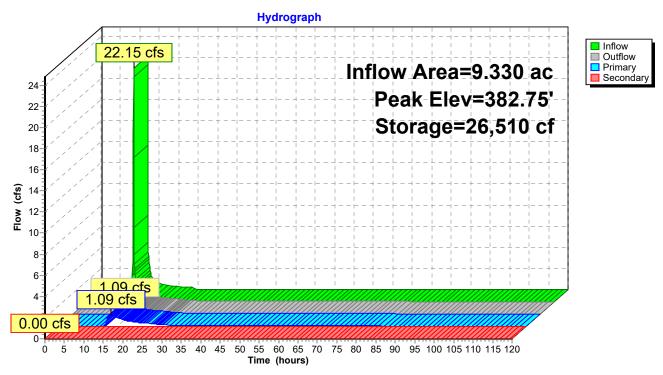
-3=Orifice (Orifice Controls 0.95 cfs @ 2.41 fps)

-4=Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=381.00' (Free Discharge)
5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Page 6

Pond 3P: WET POND 1



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Page 7

Summary for Link 1L: POST

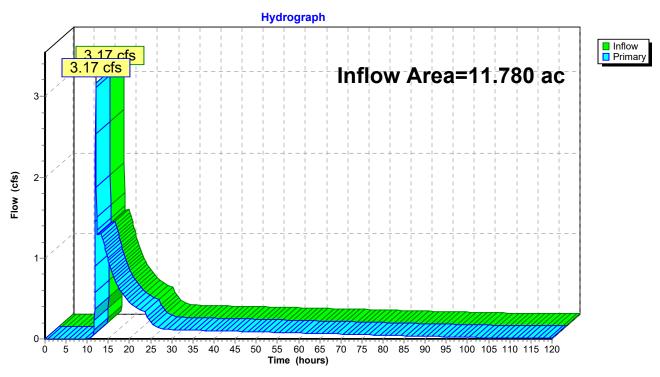
Inflow Area = 11.780 ac, 42.95% Impervious, Inflow Depth > 1.25" for 1-Year event

Inflow = 3.17 cfs @ 12.03 hrs, Volume= 1.225 af

Primary = 3.17 cfs @ 12.03 hrs, Volume= 1.225 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.05 hrs

Link 1L: POST



APPENDIX I WATER QUALITY CALCULATIONS

BMP Sizing

Sized per Simple Method (Section 3.3.1 of NCDEQ BMP Manual)

Drainage Area Impervious Area Percent Impervious 406,750 sf 213,020 sf 0.52

9.34 ac 4.89 ac

 $R_V = 0.05 + 0.9*I_A$

I_A =

0.52

 $R_v =$

0.52

 $V = 3630*R_D*R_V*A$

RD =

1 in

A =

9.34 ac

17,671.29 ft³ V =

Bottom surface area required at 15" storage

height =

14,137.03 ft²

Volume provided at 15"

18468 ft³

Orifice Equation

Outlet Diameter Cd =Ho / 3 =

2 in 0.6 0.42 ft

g =

32.2 ft / sec²

A = Q = 0.022 sf0.068 cfs

271415.0219	second

	21 14 13.02 13	Seconds
Drawdown Time	75.4	hours

APPENDIX J OPERATION AND MAINTENANCE DOCUMENTS

Operation & Maintenance Agreement

Project Name: Rolesville Road Mixed Use

Project Location: 1216 Rolesville Road, Rolesville NC 27587

Cover Page

Maintenance records shall be kept on the following BMP(s). This maintenance record shall be kept in a log in a known set location. Any deficient BMP elements noted in the inspection will be corrected, repaired, or replaced immediately. These

City, state, zip: Phone number(s): Email: Signature: I, County of personally appeared before me this acknowledge the due execution of the Operar Witness my hand and official seal,	, do hea day of tions and Maintenance	rby certify thatAgreement .	
Signature: County of personally appeared before me this	, do hea day of	ry Public for the State of	
Signature: County of	, do hea	ry Public for the State of	
Phone number(s): Email: Signature:		ry Public for the State of	:
Phone number(s): Email: Signature:		ry Public for the State of	:
Phone number(s): Email: Signature:	a Nota		:
Phone number(s): Email:		Date	:
Phone number(s):			
Phone number(s):			
•			
Street address:			
Title & Organization:			
* Responsible Party:			
l acknowledge and agree by my signature be for each BMP above, and attached O&M table changes to the system or responsible party.			
User Defined BMP	Present:	Location(s):	
Disconnected Impervious Area	Present:	Location(s):	
Wet Detention Basin	Quantity:	Location(s): See plans	
Sand Filter Stormwater Wetland	Quantity: 1	Location(s): Location(s):	
Rainwater Harvesting	Quantity:	Location(s):	
Proprietary System	Quantity:	Location(s):	
Permeable Pavement	Quantity:	Location(s):	
Level Spreader/VFS	Quantity:	Location(s):	
Infiltration Trench	Quantity: Quantity:	Location(s): Location(s):	
militration basin	Quantity:	Location(s):	
Green Root Infiltration Basin	Quantity:	Location(s):	
Green Roof	Quantity:	Location(s):	
	O + i t		

STORM-EZ Version 1.4

Seal	My commission expires

Stormwater Wetland Maintenance Requirements

Important maintenance procedures:

- Immediately following construction of the stormwater wetland, bi-weekly inspections will be conducted and wetland plants will be watered bi-weekly until vegetation becomes established (commonly six weeks).
- No portion of the stormwater wetland will be fertilized after the first initial fertilization that is required to establish the wetland plants.
- Stable groundcover will be maintained in the drainage area to reduce the sediment load to the wetland.
- Once a year, a dam safety expert should inspect the embankment.

After the stormwater wetland is established, it shall be inspected monthly and within 24 hours after every storm event greater than 1.0 inches (or 1.5 inches if in a Coastal County). Records of operation and maintenance will be kept in a known set location and will be available upon request.

Inspection activities shall be performed as follows. Any problems that are found shall be repaired immediately.

BMP element:	Potential problem:	How I will remediate the problem:
Entire BMP	Trash/debris is present.	Remove the trash/debris.
The perimeter of the BMP	Areas of bare soil and/or erosive gullies have formed.	Regrade the soil if necessary to remove the gully, and then plant a ground cover and water until it is established. Provide lime and a one-time fertilizer application.
	Vegetation is too short or too long.	Maintain vegetation at a height of approximately six inches.
Forebay	Sediment has accumulated in the forebay to a depth that inhibits the forebay from	Search for the source of the sediment and remedy the problem if possible. Remove the sediment and dispose of it in a location where it will not cause impacts to streams or the BMP.
	Erosion has occurred.	Provide additional erosion protection such as reinforced turf matting or riprap if needed to prevent future erosion problems.
	Weeds are present.	Remove the weeds, preferably by hand. If a pesticide is used, wipe it on the plants rather than spraying.
The inlet device	The pipe is clogged.	Unclog the pipe. Dispose of the sediment off-site.
	The pipe is cracked or otherwise damaged.	Replace the pipe.
	Erosion is occurring in the swale.	Regrade the swale if necessary to smooth it over and provide erosion control devices such as reinforced turf matting or riprap to avoid future problems with erosion.
	Stone verge is clogged or covered in sediment (if applicable).	Remove sediment and replace with clean stone.

Stormwater Wetland Maintenance Requirements (Continued)

Deep pool, shallow water	Algal growth covers over 50%	Consult a professional to remove and control the algal growth.
and shallow land areas	of the deep pool and shallow water areas.	
	Cattails, phragmites or other invasive plants cover 50% of the deep pool and shallow	Remove invasives by physical removal or by wiping them with pesticide (do not spray) – consult a professional.
	Shallow land remains flooded more than 5 days after a storm event.	Unclog the outlet device immediately.
	Plants are dead, diseased or dying.	Determine the source of the problem: soils, hydrology, disease, etc. Remedy the problem and replace plants. Provide a one-time fertilizer application to establish the ground cover if necessary.
	Best professional practices show that pruning is needed to maintain optimal plant	Prune according to best professional practices.
	Sediment has accumulated and reduced the depth to 75% of the original design	Search for the source of the sediment and remedy the problem if possible. Remove the sediment and dispose of it in a location where it will not cause impacts to streams or the BMP.
Embankment	A tree has started to grow on the embankment.	Consult a dam safety specialist to remove the tree.
	An annual inspection by appropriate professional shows that the embankment	Make all needed repairs.
	Evidence of muskrat or beaver activity is present.	Consult a professional to remove muskrats or beavers.
Micropool	Sediment has accumulated and reduced the depth to 75% of the original design	Search for the source of the sediment and remedy the problem if possible. Remove the sediment and dispose of it in a location where it will not cause impacts to streams or the BMP.
The outlet device	Clogging has occurred.	Clean out the outlet device. Dispose of the sediment off-site.
	The outlet device is damaged	Repair or replace the outlet device.
The receiving water	Erosion or other signs of damage have occurred at the outlet.	Contact the local NC Department of Environment and Natural Resources Regional Office.

APPENDIX K DOWNSTREAM IMPACT ANALYSIS

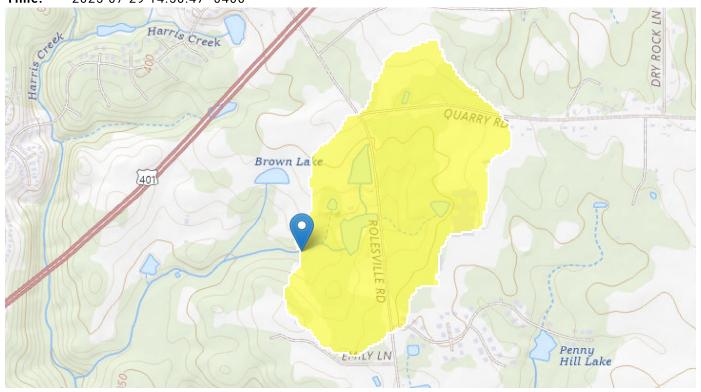
StreamStats Report

Region ID: NC

Workspace ID: NC20250729185028047000

Clicked Point (Latitude, Longitude): 35.90511, -78.44991

Time: 2025-07-29 14:50:47 -0400



Collapse All

▶ Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BASINPERIM	Basin perimeter measured along entire drainage-basin divide	2.81	miles
BSLDEM30FT	Mean basin slope, based on slope percent grid	3.76	percent
CSL10_85fm	Change in elevation between points 10 and 85 percent of length along main channel to basin divide divided by length between points ft per mi	81.7	feet per mi
DRNAREA	Area that drains to a point on a stream	0.27	square miles
ELEV	Mean Basin Elevation	396	feet
ELEVMAX	Maximum basin elevation	428	feet

Parameter Code	Parameter Description	Value	Unit
124H50Y	Maximum 24-hour precipitation that occurs on average once in 50 years	6.8	inches
LC01BARE	Percentage of area barren land, NLCD 2001 category 31	0	percent
LC01CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2001	39.3	percent
LC01DEV	Percentage of land-use from NLCD 2001 classes 21-24	7.5	percent
LC01FOREST	Percentage of forest from NLCD 2001 classes 41-43	34.5	percent
LC01HERB	Percentage of herbaceous upland from NLCD 2001 class 71	16	percent
LC01IMP	Percent imperviousness of basin area 2001 NLCD	1.03	percent
LC01SHRUB	Percent of area covered by shrubland using 2001 NLCD	0.4	percent
LC01WATER	Percentage of open water, class 11, from NLCD 2001	2.3	percent
LC01WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2001	0	percent
LC06BARE	Percent of area covered by barren rock using 2006 NLCD	0	percent
LC06DEV	Percentage of land-use from NLCD 2006 classes 21-24	7.5	percent
LC06FOREST	Percentage of forest from NLCD 2006 classes 41-43	34.5	percent
LC06GRASS	Percent of area covered by grassland/herbaceous using 2006 NLCD	16	percent
LC06IMP	Percentage of impervious area determined from NLCD 2006 impervious dataset	1.03	percent
LC06PLANT	Percent of area in cultivation using 2006 NLCD	39.3	percent
LC06SHRUB	Percent of area covered by shrubland using 2006 NLCD	0.4	percent
LC06WATER	Percent of open water, class 11, from NLCD 2006	2.3	percent
LC06WETLND	Percent of area covered by wetland using 2006 NLCD	0	percent
LC11BARE	Percentage of barren from NLCD 2011 class 31	0	percent
LC11CRPHAY	Percentage of cultivated crops and hay, classes 81 and 82, from NLCD 2011	32.5	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	7.5	percent
LC11FOREST	Percentage of forest from NLCD 2011 classes 41-43	34.5	percent
LC11GRASS	Percent of area covered by grassland/herbaceous using 2011 NLCD	14.6	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	1	percent
LC11SHRUB	Percent of area covered by shrubland using 2011 NLCD	8.6	percent

Parameter Code	Parameter Description	Value	Unit
LC11WATER	Percent of open water, class 11, from NLCD 2011	2.3	percent
LC11WETLND	Percentage of wetlands, classes 90 and 95, from NLCD 2011	0	percent
LC92FOREST	Percentage of forest from NLCD 1992 classes 41-43	39.5	percent
LFPLENGTH	Length of longest flow path	0.838	miles
LU92BARE	Percent of area covered by barren rock using 1992 NLCD	0	percent
LU92DEV	Percent of area covered by all densities of developed land using 1992 NLCD	0	percent
LU92PLANT	Percent of area in cultivation using 1992 NLCD	58.5	percent
LU92WATER	Percent of area covered by water using 1992 NLCD	2	percent
LU92WETLN	Percent of area covered by wetland using 1992 NLCD	0	percent
MINBELEV	Minimum basin elevation	358	feet
OUTLETELEV	Elevation of the stream outlet in feet above NAVD88	358	feet
PCTREG1	Percentage of drainage area located in Region 1 - Piedmont / Ridge and Valley	100	percent
PCTREG2	Percentage of drainage area located in Region 2 - Blue Ridge	0	percent
PCTREG3	Percentage of drainage area located in Region 3 - Sandhills	0	percent
PCTREG4	Percentage of drainage area located in Region 4 - Coastal Plains	0	percent
PCTREG5	Percentage of drainage area located in Region 5 - Lower Tifton Uplands	0	percent
PRECIP	Mean Annual Precipitation	46.9	inches
PROTECTED	Percent of area of protected Federal and State owned land	0	percent
SSURGOA	Percentage of area of Hydrologic Soil Type A from SSURGO	0	percent
SSURGOB	Percentage of area of Hydrologic Soil Type B from SSURGO	77.6	percent
SSURGOC	Percentage of area of Hydrologic Soil Type C from SSURGO	10.8	percent
SSURGOD	Percentage of area of Hydrologic Soil Type D from SSURGO	7.5	percent

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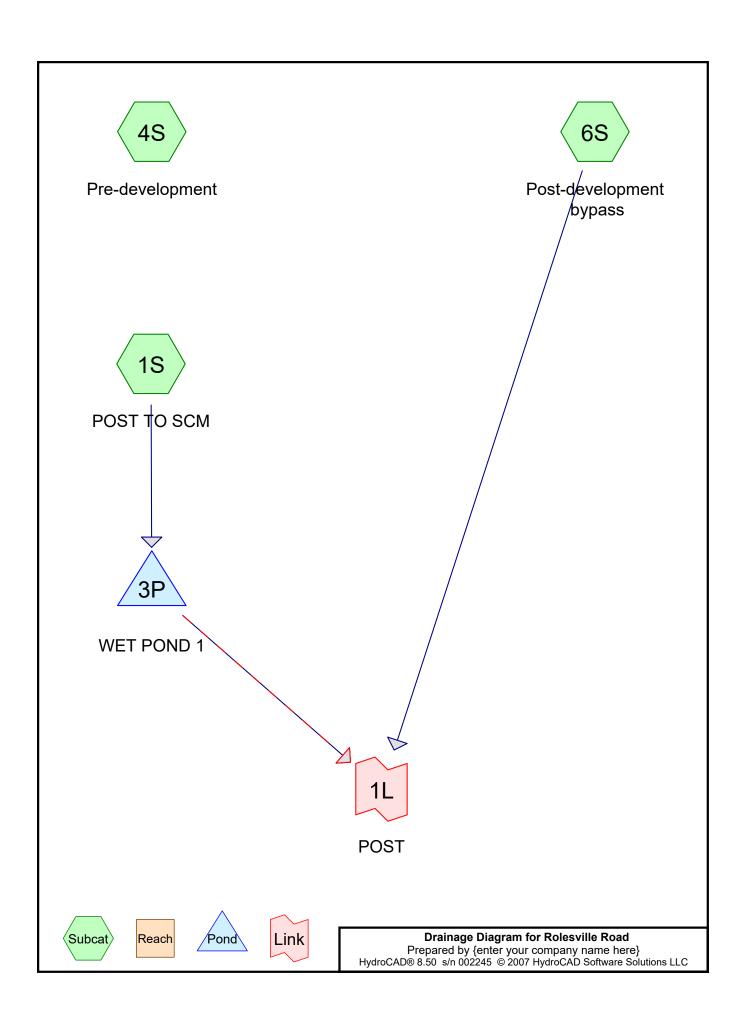
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Application Version: 4.29.2

StreamStats Services Version: 1.2.22

NSS Services Version: 2.2.1



Rolesville Road

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Page 2

Area Listing (selected nodes)

Area	CN	Description
(acres)		(subcatchment-numbers)
2.100	61	>75% Grass cover, Good, HSG B (1S)
334.670	72	Woods/grass comb., Good, HSG C (4S,6S)
2.190	74	>75% Grass cover, Good, HSG C (1S)
0.150	80	>75% Grass cover, Good, HSG D (1S)
4.890	98	Paved parking & roofs (1S)
344.000		TOTAL AREA

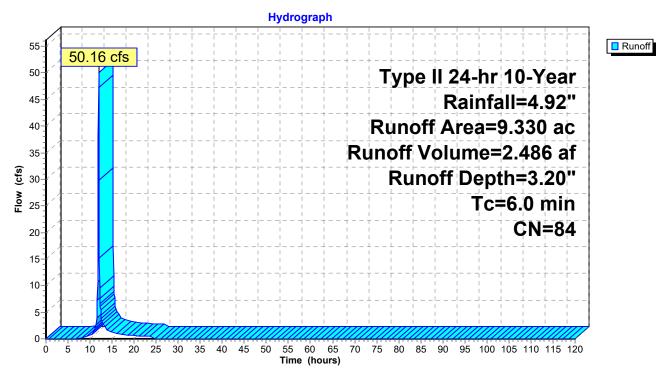
Summary for Subcatchment 1S: POST TO SCM

Runoff = 50.16 cfs @ 11.97 hrs, Volume= 2.486 af, Depth= 3.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-120.00 hrs, dt= 0.05 hrs Type II 24-hr 10-Year Rainfall=4.92"

Area	(ac)	CN	Desc	ription		
2.	100	61	>75%	√ Grass co	over, Good,	, HSG B
2.	190	74	>75%	% Grass co	over, Good,	, HSG C
0.	150	80	>75%	√ Grass co	over, Good,	, HSG D
4.	890	98	Pave	d parking	& roofs	
9.	330	84	Weig	hted Aver	age	
4.	440		Perv	ious Area		
4.	890		Impe	rvious Are	a	
_					• "	
Tc	Lengt		Slope	Velocity	Capacity	Description
(min)	(fee	t)	(ft/ft)	(ft/sec)	(cfs)	
6.0						Direct Entry,

Subcatchment 1S: POST TO SCM



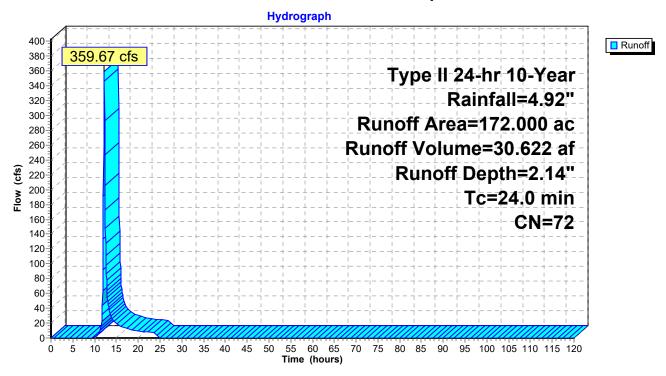
Summary for Subcatchment 4S: Pre-development

Runoff = 359.67 cfs @ 12.18 hrs, Volume= 30.622 af, Depth= 2.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-120.00 hrs, dt= 0.05 hrs Type II 24-hr 10-Year Rainfall=4.92"

 Area	(ac)	CN	Desc	cription		
172.	000	72	Woo	ds/grass c	omb., Goo	d, HSG C
172.	000		Perv	ious Area		
Tc (min)	Lengt (fee		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.0						Direct Entry, Kirpich

Subcatchment 4S: Pre-development



Rolesville Road

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Page 5

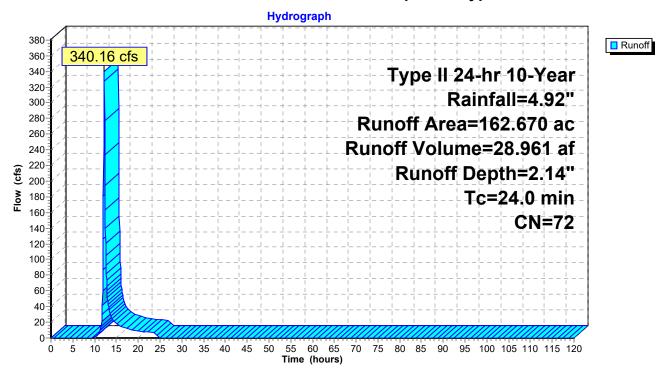
Summary for Subcatchment 6S: Post-development bypass

Runoff = 340.16 cfs @ 12.18 hrs, Volume= 28.961 af, Depth= 2.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-120.00 hrs, dt= 0.05 hrs Type II 24-hr 10-Year Rainfall=4.92"

_	Area	(ac)	CN	Desc	cription				
_	162.	670	72	Woods/grass comb., Good, HSG C					
	162.	670		Perv	ious Area				
	Тс	Leng	th :	Slope	Velocity	Capacity	Description		
	(min)	(fee		(ft/ft)	(ft/sec)	(cfs)			
	24.0						Direct Entry, Kirpich		

Subcatchment 6S: Post-development bypass



#5

Secondary

Prepared by {enter your company name here}

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Page 6

Summary for Pond 3P: WET POND 1

Inflow Area = 9.330 ac, 52.41% Impervious, Inflow Depth = 3.20" for 10-Year event

Inflow = 50.16 cfs @ 11.97 hrs, Volume= 2.486 af

Outflow = 24.06 cfs @ 12.07 hrs, Volume= 2.465 af, Atten= 52%, Lag= 6.4 min

Primary = 24.06 cfs @ 12.07 hrs, Volume= 2.465 af Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.05 hrs Peak Elev= 384.02' @ 12.07 hrs Surf.Area= 18,422 sf Storage= 48,484 cf

Plug-Flow detention time= 561.8 min calculated for 2.465 af (99% of inflow)

Center-of-Mass det. time= 556.7 min (1,364.8 - 808.1)

Volume	Inve	ert Avai	l.Storage	Storage Descriptio	n		
#1	381.0	00'	67,245 cf	Custom Stage Da	ta (Irregular)Liste	d below	
Elevatio	n	Surf.Area	Perim.	Inc.Store	Cum.Store	Wet.Area	
(fee	t)	(sq-ft)	(feet)	(cubic-feet)	(cubic-feet)	(sq-ft <u>)</u>	
381.0	0	13,729	488.0	0	0	13,729	
382.0	0	15,224	507.0	14,470	14,470	15,314	
383.0	0	16,775	526.0	15,993	30,463	16,959	
384.0	0	18,383	545.0	17,573	48,036	18,664	
385.0	0	20,047	564.0	19,209	67,245	20,430	
Device	Routing	In	vert Outle	et Devices			
#1	Primary	381	.00' 24.0 '	" x 48.0' long Culv	vert RCP, groove	end projecting, Ke= 0.2	200
	•		Outle	et Invert= 380.00' S	S= 0.0208 '/' Cc=	0.900 n= 0.013	
#2	Device 1	381	.00' 2.0"	Vert. Orifice C= 0.	.600		
#3	Device 1	382	.25' 12.0 '	" Vert. Orifice C=	0.600		
#4	Device 1	383	.50' 4.00 '	' x 4.00' Horiz. Grat	te Limited to weir	flow C= 0.600	

60.0' long x 16.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=22.66 cfs @ 12.07 hrs HW=384.00' (Free Discharge)

-1=Culvert (Passes 22.66 cfs of 26.56 cfs potential flow)

384.00'

2=Orifice (Orifice Controls 0.18 cfs @ 8.22 fps)

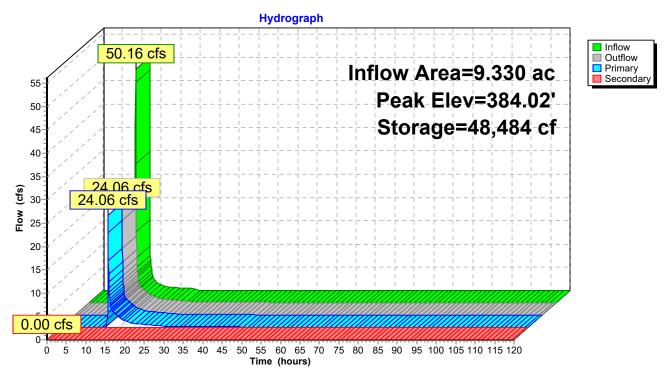
-3=Orifice (Orifice Controls 4.22 cfs @ 5.37 fps)

-4=Grate (Weir Controls 18.26 cfs @ 2.30 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=381.00' (Free Discharge)

5=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 3P: WET POND 1



Summary for Link 1L: POST

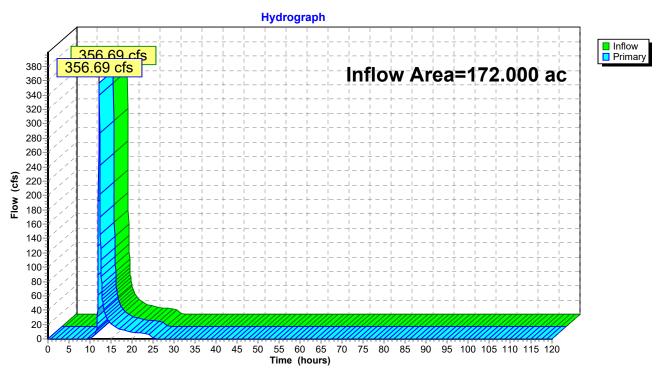
Inflow Area = 172.000 ac, 2.84% Impervious, Inflow Depth = 2.19" for 10-Year event

Inflow = 356.69 cfs @ 12.17 hrs, Volume= 31.427 af

Primary = 356.69 cfs @ 12.17 hrs, Volume= 31.427 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.05 hrs

Link 1L: POST

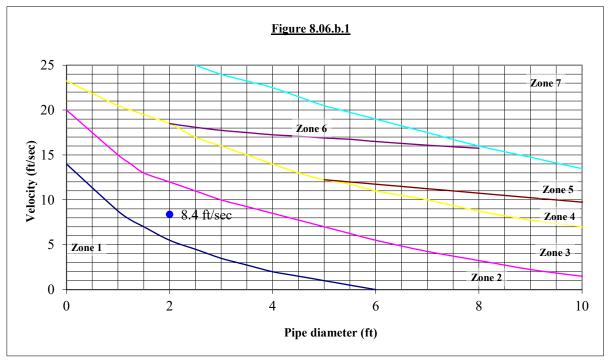


APPENDIX L RIP RAP OUTLET PROTECTION DESIGN

DESIGN OF RIPRAP OUTLET PROTECTION WORKSHEET

Project	Rolesville	Date	7/21/2025
Project No.	21029	Designer	TCM
Outlet ID	SCM 1		

Outlet flowrate	26.33	cfs
Pipe diameter	24	inches
Number of pipes	1	
Pipe separation		feet
Outlet pipe slope	2.78	percent



Zone from graph above = 2

Outlet pipe diameter	24 in.	Length =	12.0 ft.
Outlet flowrate	26.3 cfs	Width =	6.0 ft.
Outlet velocity	8.4 ft/sec	Stone diameter =	6 in.
Material =	Class B	Thickness =	22 in.
_		·	

Zone	Material	Diameter	Thickness	Length	Width	
1	Class A	3	9	4 x D(o)	3 x D(o)	
2	Class B	6	22	6 x D(o)	3 x D(o)	
3	Class I	13	22	8 x D(o)	3 x D(o)	
4	Class I	13	22	8 x D(o)	3 x D(o)	
5	Class II	23	27	10 x D(o)	3 x D(o)	
6	Class II	23	27	10 x D(o)	3 x D(o)	
7	Special study required					

- 1. Calculations based on NY DOT method Pages 8.06.05 through 8.06.06 in NC Erosion Control Manual
- 2. Outlet velocity based on full-flow velocity

APPENDIX M SKIMMER DEWATERING CALCULATIONS

Calculate Skimmer Size			
Basin Volume in Cubic Feet	17,493 Cu.Ft	Skimmer Size	2.5 Inch
Days to Drain*	3 Days	Orifice Radius	1.2 Inch[es]
		Orifice Diameter	2.4 Inch[es]
*In NC assume 3 days to drain			

Estimate Volume of Basin	Length	Width			
Top of water surface in feet			Feet	VOLUME	0 Cu. Ft.
Bottom dimensions in feet			Feet		
Depth in feet			Feet		